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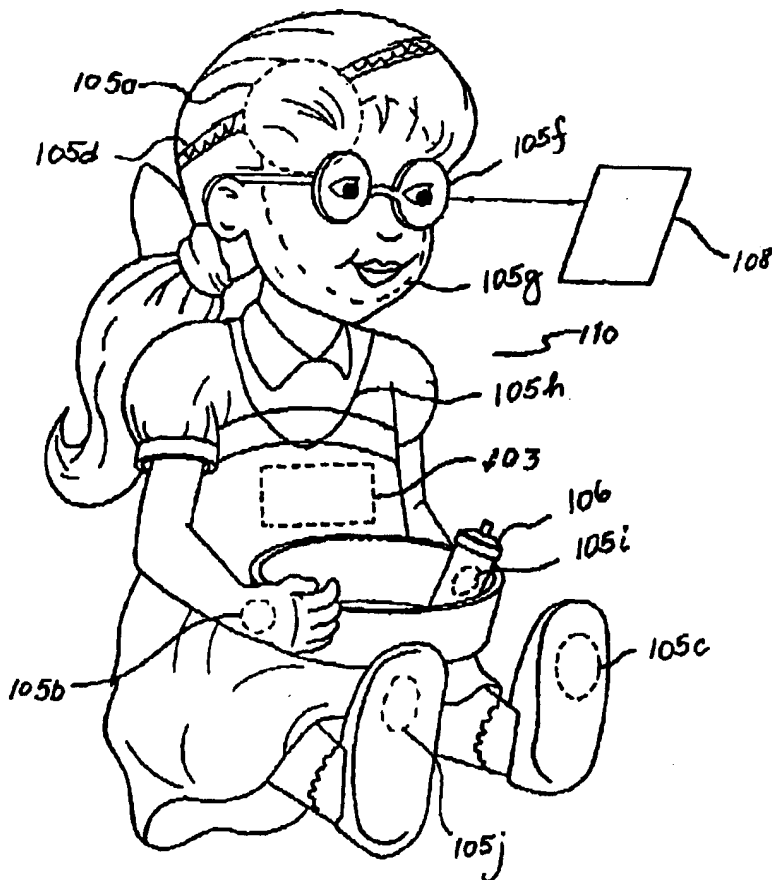
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(54) Title: OBJECT RECOGNITION TOYS AND GAMES



(57) Abstract: A toy or game play apparatus or method involving a powered host or master unit (103, 110, 120) which operates interactively with one or more nonself-powered play objects (108). The host has a preprogrammed microcontroller (213) and an RFID reader/interrogator circuit (207). Each play object (108) has a RFID tag IC (108a). When the host (103, 110, 120) and a play object (108) are positioned so as to afford RF communication between them, the host (103, 110, 120) sends power to energize the tag IC (207) of the play object (108). The host (103) recognizes that transmitted data and makes a presentation to the user caused by that transmitted data. Some or even all of the presentation may be the data from the play object (108).

WO 03/043709 A1



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## OBJECT RECOGNITION

## TOYS AND GAMES

6        This application claims priority of copending U.S.  
provisional patent application Serial 60/335,908, which in  
its entirety is incorporated by reference herein.

## FIELD OF THE INVENTION

11           This invention relates generally to toys and games,  
          particularly to toys and games that identify objects.

## **BACKGROUND OF THE INVENTION**

21 Toys are known which can respond to radio frequency (RF) signals, e. g., toy vehicles having radio frequency transmitting remote control units. Such toys typically respond to simple signals such as "forward," "stop" and "reverse." They require batteries in both the toy and transmitter.

RFID (radio frequency identification) transponder technologies are known in the prior art and used in retail store environments to sound an alert when products for which payment has not been made are removed from the premises, and in other detection systems such as automated toll-collection systems for highways, bridges and tunnels, e. g. "EZ Pass." While commercial RFID reader/interrogator circuits have been available in industrial systems such as in building access and security control systems, highway toll-taking systems such as EZ-Pass, Fast Trak,

1 and the likes, such circuits can cost from fifty dollars  
to several hundreds of dollars and thus are not suitable  
for use in a toy or game type product.

These commercial systems also involve a central or  
stationary fixed location RFID reader/interrogator detect-  
6 ing and recognizing items containing RFID tagged ICs,  
e. g. vehicles moving through toll gates using EZ Passes,  
customers filling in their gas tanks by waving RFID tagged  
cards, employees opening closed doors by waving RFID  
tagged security cards, books being checked in and out of  
11 libraries, etc. To obtain a large/long sensing and detec-  
tion area in these systems, the associated antenna or  
energy and data-coupling element is generally larger than  
the RFID reader/interrogator chip.

16 RFID electronic components, "reader/interrogator" and  
"tag" circuits, are presently available in small, inte-  
grated circuit (IC) packages from several semiconductor  
vendors such as Philips, Motorola, Texas Instruments,  
Microchip, and Atmel, to name just a few suppliers.

21 U.S. Patents 6,361,396 and 6,364,735 disclose a  
method and apparatus, which allow one toy to identify a  
plurality of objects provided. The system relies on the  
inductive coupling of the toy with a resonant frequency  
26 tank circuit contained within the object to be identified.  
Physical contact between the toy and the object is not  
required.

The inventions disclosed in these two patents, how-  
ever, have several limitations. One example is the total  
31 number of objects that the master unit can recognize, as  
well as the total number of objects that can be simulta-

1 neously recognized and distinguished, is limited. Fur-  
thermore, when dealing with multiple objects, a number of  
discrete frequencies in combinations have to be transmit-  
ted to be able to determine the sum/differences in fre-  
quencies to identify objects. Nor with the method of the  
6 above-mentioned patents can any information or changing or  
variable information, such as quantities, be written back  
to the object and stored for later recall, revisions, or  
can additional information be written or updated. This  
limits the play patterns and game play actions possible.

11 The game industry is always looking for ways to  
enhance game units and game/play patterns, while keeping  
the cost of production down. The present invention ful-  
fills this need.

16

#### SUMMARY OF THE DISCLOSURE

In accordance with the disclosure, contactless or  
remote identification of objects by toy dolls and other  
21 toys can be achieved through the use of RF (radio fre-  
quency) transponders, commonly referred to and known to  
those skilled in the art as RFID Tag integrated circuits,  
"tag ICs," or "tags." A master/host/server toy or game  
unit (also herein referred to as "master unit") can iden-  
26 tify and recognize something that is placed within range  
of the host without any physical or mechanical contact  
through the application of RFID technology. Objects to be  
recognized and identified by the master/host/server toy or  
game unit need only contain a small RFID tag transponder  
31 integrated circuit chip (tag IC) and a suitable RF antenna  
or energy and signal-information coupling element. Such

1 objects do not require a self-contained battery or other  
power source to be recognized. No optical code (e. g. bar  
code), invisible ink, ultraviolet or infrared ink is  
required, nor is mechanical or physical contact necessary  
between the recognizing toy and object to be recognized.

6 Tag ICs can respond differently from one another when  
interrogated by an appropriately programmed mas  
ter/host/server toy or game unit. The tag ICs transmit  
and receive information in the form of data bit streams to  
and from the master/host/server toy or game unit. The tag  
11 ICs receive their operating power from the RF energy  
transmitted by the master/host/server at the same time as  
data exchange occurs. The tag ICs do not require their  
own separate power source.

In addition to a toy or game master/host/server  
16 reading an object's identity from its tag IC chip, tag IC  
chips can receive information in the form of many digital  
bits written back and stored indefinitely in non-volatile  
digital or analog memory onboard the tag IC chip. This  
feature enables the creation of play substance  
21 quantitative and nonquantitative attributes such as in the  
form of kid's money, or a portable store of value, that  
can be held, transferred, traded, or otherwise exchanged  
with compatible devices, such as trading cards or "play  
money," which contain read/writeable RFID tag ICs  
26 containing non-volatile, electrically reprogrammable  
memory bits, utilizing appropriately programmed mas-  
ter/host/server toy or game units containing an RFID  
reader/interrogator circuit and suitable antenna. (The  
word "write" is used herein to also include rewrite and  
31 update. This write, rewrite, and update can be repeated a

1     number of times as required or designed by the game play  
or toy play-patterns.)

       This feature, for example, also could be used with a  
doll to simulate consumption and replenishment of a  
resource, such as pretend milk in a toy milk bottle given  
6     to the doll. When a child presents a "full" milk bottle  
with an RFID tag IC inside it programmed as "full", then  
the doll can simulate drinking the milk, and the  
master/host/server can gradually reprogram the RFID tag IC  
in the milk bottle to be less and less full, as indicated  
11    by the setting of some selected data bits in the milk  
bottle RFID tag IC memory, via the rewriteable feature.  
When the milk bottle is "empty" the doll could possibly  
cry and ask for more milk. Then the toy milk bottle would  
have to be taken over to a different master/host/server  
16    toy, perhaps in the form of a cow or a dairy, so as to be  
"refilled" by way of having the selected data memory bits  
of the milk bottle RFID tag IC be reprogrammed  
accordingly.

       A trading card, a game-playing card, a teaching flash  
21    card with visual information printed on it, a game-playing  
token, coin or piece of currency, or other small object  
can be provided with an embedded RFID tag chip and  
suitable antenna loop or coil, factory programmed with  
specific bits of read-only data in the tag IC memory. This  
26    card can be recognized by a talking doll, for example,  
that can then recite information about the card. The  
information can exceed that printed on the card and, for  
example, can contain secret information about the card  
that can only be accessed by a master/host/server toy or  
31    game unit. A doll can then recognize and recite  
information about the trading card. In other words, at

1 least some of the recited information may be stored on the  
card. Possibly most or even all of the recited  
information may be stored on the card. This can greatly  
minimize the requirement on the doll memory to store such  
recited information.

6 A tag IC with a suitable small antenna loop or coil  
can also be placed inside a small plastic figure, such as  
an action figure molded from plastic, that can be  
recognized by the doll or a reader device.

11 Such master/host/server toy or game units can play  
games such as spelling games, arithmetic games, shape and  
other recognition games, board games, duels games, battle  
games, wagering or betting games (e. g. betting on random  
or statistical behaviors for fun), and other games.

16 Master/host/server toy or game units can be employed to  
recognize trading cards and other two and three dimen-  
sioned collectibles. A master/host/server toy or game unit  
can act on a tag IC in a collectible to change its data  
thereby selectively making it compatible or incompatible  
with other master/host/server toy or game units, thereby  
21 providing the ability to "catch" or "collect" a specific  
object or flash or trading card by a specific owner, after  
which it cannot be caught or collected by another, unless  
the owner agrees to trade it electronically to another  
owner, using the master/host/server toy or game  
26 controller.

31 Objects to be recognized and master unit toys may be  
in any two or three-dimensional form. Objects typically  
include things such as flash cards containing letters,  
numbers, words, pictures, animals, etc. Objects may also  
include miniature objects such as toy baby bottles, food  
items, common household objects, discs, tokens, pictures,



1 coins, currencies, houses, etc. Action figures,  
figurines, vehicles, animals may also be used as objects,  
as well as master unit toys.

6 In another aspect of the invention, an RFID  
reader/interrogator cartridge or accessory may be  
received, plugged into, and/or connected and operated by  
game/computing devices such as hand-held electronic game  
computing devices, PDAs (personal digital assistant),  
hand-held computers, tablet computers, and the like — for  
11 example, GAMEBOY and GAME BOY ADVANCE units from NINTEN-  
DO®, PALM™ hand-held computing devices from Palm, Inc., or  
iPaq hand-held computing devices from HP. Alternatively,  
the RFID reader/interrogator may be built-in into these  
game/computing devices.

16 The RFID reader/interrogator accessory is generally  
plugged into the game/computing device. The RFID reader  
accessory may also have an interface to accept and connect  
game cartridges or game packs, which contain ROM  
program(s) to operate the game or program with the RFID  
21 reader/interrogator accessory.

Game-play operations of these game/computing devices,  
e. g. video game or hand-held computing devices,  
generally involve reading information from RFID tag chips  
that are embedded in various objects or placed in objects  
26 at various locations. This reading of information may  
also involve modifying variable play substance values,  
such as adding power and points, or just generally  
enhancing the game play. This game-play operations may  
also be used for educational game purposes.

31

1     BRIEF DESCRIPTION OF THE DRAWINGS

          Fig. 1A is a perspective view of one type of toy which can serve as a master/host/server or master unit toy in accordance with a preferred embodiment of the  
6     invention;

          Fig. 1B is a perspective view of another type of toy which can serve as a master/host/server toy in accordance with a preferred embodiment of the invention;

          Fig. 2 is a functional schematic block diagram of a  
11     master/host/server toy and the play objects which it is intended to sense in accordance with a preferred embodiment of the invention;

          Fig. 3 is a diagram showing orthogonal antennas in accordance with a preferred embodiment of the invention;

16     Fig. 4 is a schematic diagram of an exemplary circuit using four loop antennas and eight MOSFET transistors in accordance with an embodiment the invention;

          Fig. 5 is a functional schematic diagram of an exemplary master unit that includes a voice/sound  
21     generator or synthesizer in accordance with an embodiment the invention;

          Fig. 6 is a schematic diagram of an exemplary master/host/server toy that includes a visual display generator/controller in accordance with an embodiment of  
26     the invention;

          Fig. 7A is an elevation view of another preferred embodiment of the invention;

          Fig. 7B is a plan view of the preferred embodiment of the invention shown in Fig. 3A;

1           Fig. 7C is an elevation view of the preferred  
embodiment of the invention shown in Fig. 7A, with a modification

          Fig. 8A is a front elevation view of still another  
preferred embodiment of the invention;

6           Fig. 8B is a side elevation view of the preferred  
embodiment of the invention shown in Fig. 8A;

          Fig. 9A is a plan view of a hand-held game device  
with a radio frequency identification (RFID) cartridge and  
an exemplary play object to be recognized, constructed in  
accordance with a preferred embodiment of the invention;

11          Fig. 9B is a like view of Fig. 9A showing how a game  
cartridge, an RFID cartridge, and a hand-held device  
interconnect with each other;

16          Fig. 9C is a perspective view of a video game device  
master unit with a built-in RFID reader/interrogator in  
accordance with an embodiment of the invention;

          Fig. 9D is a plan view of a hand-held computer, such  
as a PDA, with a built-in RFID reader/interrogator in  
accordance with an embodiment of the invention;

21          Fig. 10A is a flowchart to handle and process owner-  
ship and value information of play objects in accordance  
with an embodiment of the invention;

          Fig. 10B is an exemplary master/host/server toy  
processing transfer of play objects — transactor, in  
accordance with an embodiment of the invention;

26          Fig. 11 is another embodiment of a toy or game with a  
master/host/server vehicle and a number of exemplary play  
objects, in accordance with an embodiment of the  
invention;

31          Fig. 12A is another embodiment of a toy or game with  
a master/host/server wand or hand-held unit and a number

1 of exemplary play objects, in accordance with a preferred embodiment of the invention;

Fig. 12B is another embodiment of the hand-held unit, wand, scanner, or waver of Fig. 12A in which the circuit elements of the RFID RI master unit are partitioned such that the antenna/energy and data-coupling element together with the RF circuit portions are in the hand-held portion and the remaining circuitry of the mater unit is in a separate section connected by a group of wires in a cable; and;

11 Fig. 12C is a like view of Fig. 12A but with the master/host/server interacting with a play object with a number of RFID tag ICs;

Fig. 13 is another embodiment of a toy or game with two exemplary master/host/server toys and a number of exemplary action figure play objects, in accordance with an embodiment of the invention;

Fig. 14A is yet another embodiment of a toy or game with a master/host/server tractor and a number of exemplary play objects, in accordance with an embodiment of the invention;

Figs. 14B through 14E illustrate how a master/host/server toy interacts with an exemplary play object, in accordance with a preferred embodiment of the invention;

26 Fig. 15 is yet other embodiments of master/host/server toys, in accordance with an embodiment of the invention;

Fig. 16 is yet another embodiment of a board game master/host/server interacting with coin play objects, in accordance with an embodiment of the invention; and

1           Fig. 17 is still another embodiment of a board game  
with a number of RFID tag IC and acting as a play object,  
in accordance with an embodiment of the invention.

6           DETAILED DESCRIPTION  
OF THE PREFERRED EMBODIMENTS

11           In a first embodiment of the invention, RFID  
technology is used to make a doll appear to "see" flash  
cards or other objects, recognize them by name, and engage  
in play activity with them.

16           For example, in a "shape" game, the doll asks a child  
to show or give the doll a specific shape, such as "the  
blue square" or "the red triangle". The doll has a small  
loop antenna inside a hollow cavity in the chest area, so  
that as flash cards or objects are presented to the doll  
to "hold in its arms", a master/host/server toy or game  
unit program can detect them and respond with a voice in  
the appropriate manner. (Master/host/server is herein  
21 also referred to as master unit.)

26           Furthermore, the sensing coil or coils, or sensing  
antenna coupling elements of the master unit contained in  
the doll, can be located in different places, such as the  
head, or in a hand or foot, to localize the region where  
the target object will be detected. (Note that the  
embodiments of the invention are not limited to having  
coils as the only form of antenna or energy/signal  
coupling elements. Antennas can include a number of  
forms/elements, including, coils, loops of wire, or other  
31 conducting materials, plates, areas, surface, or other  
forms. The antenna and energy and signal information

1 coupling elements may also include capacitive coupling as well as inductive coupling means.)

In addition, the doll could include not just one, but multiple sensing antenna coils, located in various places on the doll, and which are switched on and off by control of the host microprocessor system. Such locations could include a coil in each hand of the doll, a coil in each foot, a coil in the doll's head, and a coil in the doll's abdominal cavity. Such a doll could play games with multiple objects, but might also play games with a single object by directing the user to sequentially position that object at different antenna, and recognizing and reporting back to the user as to the success or failure of each attempted positioning.

In conjunction with the selectively switching of the active antenna coil, the doll could ask the child to place a specific object in the doll's right hand, or in its left hand, for example. Utilizing a voice synthesizer, the doll can ask for specific shapes to be given to it, and then for them to be taken away, one at a time, with responses given as to whether each correct shape was provided.

It is also possible that more than one or all antenna be active simultaneously. This way a doll, for example, can ask for specific shapes to be handed to it. The shapes may be placed, for example, in either hands and still be recognized accordingly.

Objects presented to the doll can have numbers or spelling words which can be enunciated by an electronic voice synthesizer in the doll. The master unit can make animal sounds or other sound effects corresponding to a picture card or sculpture of a presented animal or other

1 sound effect such as a fire engine or motor car. The  
master/host/server or master unit may be provided with  
recorded or synthesized music for playing different songs  
and tunes, perhaps in different voices or with different  
sounding musical instrument sounds such as a trumpet or a  
6 flute, a violin or a trombone, and also with many  
different percussion sounds such as drums, bells,  
whistles, and other sound effects.

The master/host/server or master unit may also  
provide user presentations that are completely nonaudio.  
11 For example, visual presentation on a display, tactile  
presentation (e. g. vibrating master/host/server toy), and  
olfactory presentation may also be presented. The master  
unit, however, has to include appropriate components to  
handle such presentation. Audio and nonaudio  
16 presentations may also be combined.

In accordance with the disclosure, a doll or other  
master/host/server or master unit can remotely recognize  
and identify an object, flash card, token, or other thing  
with no physical or mechanical contact. The toy or doll  
21 or game can recognize just one thing at a time, or a  
multiplicity of many things at the same time (that is  
within a few hundred milliseconds of one another) by  
utilizing the so-called "anti-collision" feature of  
certain RFID tag ICs which are commercially available.  
26 Object detection in general is handled by one or more  
programs operating on microcontroller ICs in master  
units, in conjunction with RFID reader/interrogators.

Referring to Figs. 1A and 1B of the drawings, there  
are shown a girl doll 110 and a baby doll 120,  
31 respectively, each of which can contain an "engine" in the  
form of a master/host/server toy or game unit 103. In

1 addition to an integral antenna 105 located within the  
master/host/server toy or game unit (master unit) 103  
mounted in the doll's chest cavity, another antenna 105a  
can be connected to the master unit 103 and mounted within  
the head of the dolls 110 and 120.

6 The characteristics of the antenna, such as number,  
placement, and shape, may vary depending on toy design.  
The dolls 110, 102, for example, may include additional  
antennas such as an antenna in an external hair band  
around the head 105d, inside the doll head and around the  
11 face area 105g, 105m, in either or both frames of the  
eyeglass 105f, in a necklace 105h, in either or both hands  
of the doll 105b, 105l, in either or both feet or shoes of  
the doll 105c, 105j, in the holder 105i, in the tummy  
105k, etc.

16 Each of the dolls 110 and 120 is shown interacting  
with a play object 108. The girl doll 110 is interacting  
with one in the form of a card, while the boy doll 120 is  
interacting with one in the form of an action figure.

21 Play objects, as well as master unit toys, may be in any  
two or three-dimensional form, such as bottles 106,  
trading cards, pictures, flowers, stuff dolls, lamps,  
grocery items (e. g. fruits, milk cartons, vegetables,  
etc.), vehicles, currencies, animals, etc.

26 The girl doll 110 may interact with a bottle play  
object 106 such that the bottle may be identified as full,  
half-full, or empty in a game or play pattern. It may  
also identify cards, such as identifying the shapes print-  
ed on the card. The boy doll 120 may identify and  
31 interact with various action figures according to the play



1 pattern program controlling the microcontroller or microprocessor

Referring now to Fig. 2, there are shown a plurality of play objects 108 that each include a nonself-powered RFID transponder tag IC 108a and an RF antenna 108b. The play object may be, as discussed above, in any form such as a flash card, a trading card, or small object molded from a non-conducting, non-RF-shielded material.

The RFID tag ICs 108a are nonself-powered, in the sense, that they do not need their own power source, like a battery. They obtain their power from the master unit via inductive or capacitive coupling of sufficient energy using the antennas or energy coupling elements. No physical contact is required to convey the operating energy and power to the tag IC.

Radio signal communication of power and data to the play objects may be accomplished by various means, including inductive and/or capacitive coupling — primarily by magnetic and/or electric field components of the electromagnetic radio signal.

Fig. 2 also shows a master/host/server toy or game unit 103 (master unit) having an RF transmitting and receiving antenna sensing element or coil 105. This antenna may be of the primarily inductive coupling or primarily capacitive coupling type.

The master antenna element or coil 105 is tuned to the resonant operating frequency of the RFID tag ICs, and their associated antennas. The master antenna element or coils 105 are operatively connected to a reader/interrogator circuit 207.

The master/host/server or game unit 103 and the RFID tag ICs, regardless of the number of RFID tag ICs,

1 generally need to only communicate with each other using  
one fixed frequency. Because the RFID tag circuit  
operates at a single fixed frequency, the resonant circuit  
can be tuned for optimum Q, the quality factor, and thus  
perform with maximum energy coupling efficiency, which  
6 also reduces the amount of power required from the  
batteries or other power source to the master unit. The  
life of a battery or batteries in battery-operated toys  
thus may be extended as a result of the RF operation at  
one fixed frequency. Multiple frequency operation to  
11 communicate with more than one RFID tag ICs is  
unnecessary. Backup frequency, however, may also be  
implemented as part of the toy design.

The frequency of the radio signal can be at various  
standard frequencies used by the industry in standard  
16 components, including the one hundred twenty five (125)  
kHz (nominal) band, the thirteen (13) MHz (nominal) band,  
or other frequencies that may now be used or in the future  
by RFID technologies, such as fifty MHz, one hundred MHz,  
VHF, UHF, SHF, or SUFH frequency bands.

21 The circuit 207 transmits power to, and receives data  
transmitted from, the RFID tag ICs 8a within its range.  
The circuit 207 may also transmit data to the tag ICs.  
The play object 108 may typically be positioned about one  
to four inches from the master antenna 105, or possibly  
26 further. In certain play patterns, the detection range  
may be as minimal as one tenth of an inch to as many as  
twelve to twenty-four inches or more.

When the reader circuit 207 transmits energy to a  
tag IC, that tag IC uses the power to transmit its unique  
31 or identity data back to the circuit 207. The master unit  
103 then uses that unique data to identify or "recognize"

1     that object 108. That unique data may be serial numbers.  
Thus, a card containing a picture of a horse can be  
distinguished from one containing a picture of a pig.

6     In one embodiment, each play object in a product line  
of toys is unique. This may be accomplished by having a  
unique piece of information associated with each play  
object within that product line. Serial numbers may be  
used. A smaller or larger collection of unique play  
objects may also be defined.

11    Serial numbers may be assigned and written in the  
RFID tag ICs during the manufacturing process. In one  
embodiment, a range of serial numbers or a particular  
serial number is assigned to an entity, such as apples.  
Thus, when a serial number within this range or that  
particular serial number is read from an RFID tag IC, the  
16    master unit accordingly and appropriately recognizes this  
object as an apple.

21    In another embodiment, serial numbers are not used,  
but rather a different identification information is used.  
In this embodiment, a set of ASCII data is stored to  
identify that object. For example, if the object is an  
apple, the ASCII equivalent of the word "apple" is stored  
in the RFID tag IC. When that object is detected, the  
identification information, in this case, "apple" is read.  
The master unit accordingly recognizes this object as an  
26    apple. This ASCII information may also be used by a  
text-to-speech synthesizer to say the word "apple."  
Serial number and identification information may both be  
used in an object.

31    It is also possible that data is not unique to a set  
of play objects. For example, it is possible that in the  
play-pattern or game, there are two red cards, and are

1 accordingly identified as such, for example, having the  
same serial number. Part of the game play is determining  
whether the two play objects are the same or different.

The uniqueness or degree of uniqueness of play  
objects in a collection, whether in a product line, in a  
6 master unit/play objects combination, in a toy package,  
and the like, depends on product design, marketing, toy  
packaging, game play pattern, etc.

The reader/interrogator circuit 207 is operatively  
connected to a microcontroller/microcomputer 213. The  
11 microcomputer 213 has a microprocessor. The  
microprocessor is connected to one or more ROMs (read-only  
memories) 214 that contain program code (or control  
program) for controlling the responses of the  
master/host/server or master unit 103 to the data received  
16 from the tag ICs 108a. The data from the tag IC  
"triggers" or causes the response of the host unit 103.

The program code or control program is generally a  
set of executable object code or machine instructions. It  
can be written in a variety of source code programming  
21 languages and then compiled and/or assembled into execu-  
table machine code or instructions appropriate for the  
target microcontroller. For example, the control program  
may be written in the C programming language and compiled  
into runtime object code. The control program could also  
26 be written in the native assembly language suitable for  
the microcontroller and assembled into run-time machine  
executable object code.

The control program operate all aspects of the input/  
output control circuitry of the master/host/server or  
31 master unit, including the control of the RFID transmitter  
and receiver master circuit and the control of its read

1 and write modulation of the RF carrier signal used to  
interface to the RFID tag chip transponders (play  
objects).

The microprocessor is also connected to RAM (random  
access memory) for temporary storage of operating data.  
6 Provision for connecting additional ROMs 215 to expand  
operating functions and modes is provided in the form of  
external cartridge connectors 217 which allow additional  
ROMs 215 to be piggybacked onto or daisy chained to the  
basic ROMs 214. The microcomputer 213 may have a  
11 plurality of miscellaneous I/O lines to arm/hand switches  
and other doll sensors.

The microcontroller includes various input and output  
lines, which can control other portions of the electronic  
circuit of the master unit, monitor pushbuttons or  
16 mechanical switch contacts, send and/or receive serial  
data streams, control available visual indicators, such as  
LEDs, and perform general input/output control for the  
entire master unit.

A voice/sound synthesizer circuit 219 is connected to  
21 the microcomputer 213 for converting digital data signals  
generated by the microcomputer in response to or caused by  
the data received from the interrogated tag ICs 108a to  
analog voice, music or other sound signals. The sound  
circuit 219 may include CELP, ADPCM, or the like.

26 As noted above, at least some, and possibly most or  
all, of the data signals generated may be data returned  
from the memory of the object 108. The analog sound  
signals are then applied to the input terminals of an  
audio amplifier 221 for driving a speaker 223 which  
31 reproduces the sounds for listening at an audible level.

1           The microcomputer 213 and its associated components,  
including the microprocessor, the voice/sound synthesizer  
circuit 219, and the amplifier 221 are powered by  
batteries contained in a power supply 225. For example,  
four AA or C alkaline batteries may be used. DC operating  
6       power can also be supplied from main AC line voltage by  
way of a suitable step-down transformer, rectifier and  
filter circuit as is commonly found in small, plug-in  
power supplies, so as to save on use of batteries when in  
a fixed location. DC operating power could also be  
11       supplied from twelve (12) VDC found in motor vehicles such  
as cars, trucks, busses, campers and even airplanes, by  
way of a suitable electrical connector and cable connected  
to a DC voltage regulator in the doll engine 103.

16           "Smart trading and game-playing cards" are another  
toy or game application of RFID technology according to  
the invention. Trading cards — e. g. baseball cards,  
football cards, and character cards, game-playing cards —  
e. g. action cards, duel and battle game cards, and role-  
21       playing cards, and other collectibles can each contain an  
embedded RFID tag IC for enabling novel uses for trading  
cards and collectibles in conjunction with dolls, and  
various other master/host/server toy or game units. The  
master/server/host unit can then detect each collectible  
26       as it is added to the collection and maintain information  
about the inventory of collectibles.

Each collectible can have, stored in its tag IC, data  
which associates the collectible with its owner. No other  
master unit toy or game unit can recognize, transfer, or  
31       exchange the collectible until its owner enables the  
stored data to be changed for associating it with a new

1 owner's master unit toy or game unit. That is, once a  
specific figure or other collectible is "caught" or  
"collected" once by someone, it cannot be caught or  
collected again by someone else, unless it is "traded" by  
the original owner to a new owner.

6 In still another embodiment of the invention, an RFID  
tag IC can be used to store the "collection" and  
"ownership" values in the memory of a tag IC embedded in  
an owner or collectors "master card," and to allow for  
trading or exchange of value with another owner/collector  
11 for creating "kid's money."

In many conventional trading card games, points are  
gained and lost during the play of the game. With these  
smart trading cards, points and values may be read and  
written during the course or play of the game.  
16 Furthermore, because these smart trading cards obtain its  
power from the master unit, a power source is not needed  
to be directly attached to these smart cards.

Smart trading cards may be implemented using  
inductive coupling with coils or using capacitive coupling  
21 with electrodes formed from printing conductive inks on  
the surface of the cards. Such conductive inks include  
black inks with "carbon black," i. e. conductive carbon  
particles are blended with conventional or water-based  
printing inks, and are printed with standard offset,  
26 lithographic or other printing processes.

Conductive inks may be aluminum, silver, gold, or  
other conductive materials printed on the back or inside  
surfaced of the cards.

With such smart trading cards and other play objects  
31 (described herein), the play substance values and  
information stored in the RFID tag ICs may be read and

1 updated (written) during the course of the game. Such  
play values/information may include virtual money, virtual  
weight of precious metal or a useful commodity, or virtual  
volume of valuable liquid for barter or negotiation in a  
game. It may also include virtual characteristic or  
6 attribute values quantitatively measured. Such play  
substance values/information may also be in nonquantita-  
tive form. For example, such values may include "Y" and  
"N" for "yes" and "no," respectively. Other values  
include non-numeric values such as "turtle," "cow,"  
11 "house," "A," "B," symbolic symbols (for visual displays),  
and the like.

Considering that play objects in general, and not  
master units, contain values and information, a player can  
take a play object to another master unit that has never  
16 previously been specifically informed about earlier game  
transactions with that play object, and still have the  
game ensue based upon earlier play by that particular play  
object in earlier transaction with the earlier master  
unit. The game ensues particularly based on infor-  
21 mation/values stored in the play object by the earlier  
master unit. All, majority, or portion of the prior  
ownership and/or transaction value and history can be  
stored on the tag IC memory of the play object.

The master unit can be another toy or game apparatus,  
26 for example, in a public location such as a retail store  
or eating establishment like a restaurant. The play  
object with the RFID tag IC can be presented at the store  
to gain credits, obtain free prizes, bonuses, or discounts  
on purchases, or other benefits. Additional values or  
31 play substance values may also be added to a play object  
at the store or point-of-purchase location.



1           For example, if a smart trading card containing  
virtual money information is used in a casino game/play  
pattern, a child may use this smart card, i. e. the  
virtual play money, and bring it today to friend A to play  
with, and then take whatever virtual play money the child  
6       has ended up with after playing with friend A to friend B  
and C tomorrow. Thus the burden of keeping track of game  
play transactions (including ownership transfer, hit  
points changes, attributes changes, virtual money losses  
and increases, etc.) is not placed on any particular  
11       master/host/server.

          An example of a microcontroller 213 that may be used  
in an embodiment of the invention is the RSC300/364 device  
from Sensory, Inc. of Santa Clara, CA. This component can  
16       be purchased from the company at prices as low as \$1.50  
per device. This low price qualifies the device as  
suitable for toy and game use.

          The RSC300/364 is optimized for audio speech and  
sound output, as well as for speech input. The CPU  
21       portion of the device includes a suitable instruction set  
for controlling the RFID transponder devices, as well as  
to initiate output of speech, voice, sound or music  
signals from data tables stored in the fixed data memory.

          Similar microcontrollers, such as the W536  
26       "ViewTalk<sup>SM</sup>" series of microcontroller chips from Winbond  
Semiconductor Company Ltd., Taiwan, would also be  
suitable. These chips generally support sound and speech  
audio output, and also include circuitry for operation of  
a typical LCD display screen containing alphanumeric  
31       characters and/or graphical, pictorial "icons".

1           Generally, the microcontroller 213 controls some  
external circuitry which embodies the RFID radio frequency  
control and data read/write transfers between the various  
RFID tagged objects and the main host control.

6           A Hitag reader chip, HTRC110, from Philips  
Semiconductor Corp. is an example of an RFID transponder  
reader/interrogator chip 207 used in a master unit 103.  
This device comprises a complete one hundred twenty five  
(125) kHz RFID transponder controller. It can be used with  
RFID transponder tag ICs operating in the one hundred  
11           twenty five (125) kHz frequency range.

          In one embodiment, the HTRC110 is made to work with  
Philips HiTag RFID tag devices, sold commercially by  
Philips Semiconductor. These RFID tags are placed in play  
objects to be recognized by the toy or game.

16           While the HTRC110 device is named a "reader" by the  
manufacturer, it can also be used as a "writer" of data  
back into non-volatile read/write memory contained in  
certain kinds of RFID tag devices which support read/write  
memory operations.

21           Generally, very few external components are required  
to operate the HTRC110 IC in accordance with the  
invention. For example, only a few capacitors and a  
crystal for the precise control of timing within the IC  
are needed. Furthermore, only three digital I/O  
26           (input/output) lines are required to interface the entire  
RFID Reader IC to the microcontroller: Data In, Data Out,  
Serial Clock. This is well known and widely used in the  
industry, and is sometimes known as an I2C link.

31           The control program in the microcontroller transmits  
control and data information to the reader/interrogator

1 IC, and reads back control and data information from it  
via the above-mentioned three serial data lines.

Any and all control and data exchange functions of  
the RFID reader/interrogator chip may be implemented via  
the above-mentioned three lines: transmit RFID carrier  
6 On/Off, read data, write data, modulation control or the  
RFID carrier, demodulation control of received data, and  
error detection and correction.

As mentioned above, data/play values may also be  
updated or written back to the memory of the RFID tag ICs.  
11 These data may represent increased points in a game,  
ownership identification of a plastic toy figurine, or  
other toy and game-related information.

Another example of an RFID reader/interrogator is the  
standalone tag reader circuit (STARC), MC33690, from  
16 Motorola. RSC-300/364 chips from Sensory, Inc. in Sunny-  
vale, California may be used as voice/sound generator  
chips.

Philips HiTag RFID tag devices may be used in play  
objects. These RFID tags include the feature of reading  
21 and writing back data into a non-volatile memory on the  
tag IC device.

HiTag devices also support the so-called "anti-col-  
lision" feature that enables more than one RFID tag device  
to be recognized and controlled within the range of the  
26 play field antenna. They operate in the one hundred  
twenty five (125) kHz frequency band. This type of device  
generally uses amplitude modulation (AM) for the  
write-to-tag-memory process, and AM/PM for the read  
control.

31 The anti-collision feature functions in such a way  
that there is a random delay or a programmed delay in

1     which a specific RFID tag IC remains "off," i. e. does not  
respond with a transmission back to the RFID reader/inter-  
rogator. This way multiple RFID tag ICs (play objects)  
may be polled sequentially. This gives rise to the  
appearance of simultaneous responses because the time  
6     required for an interrogation/response is quite brief —  
tens or hundreds of milliseconds.

      MCRF200, a contactless programmable passive RFID  
device, from Microchip Technology, Inc. may be used as an  
11    RFID tag IC. This chip, however, only allows for read-  
only data transmission. It also does not support  
anti-collision, thus it is suitable for "one at a time"  
play-object recognition game pattern.

      If anti-collision features are desired, MCRF250 and  
16    MCRF355/360 from Microchip Technology, Inc. may be used in  
play objects. These chips may be used when multiple  
objects are to be detected at apparently the same time in  
a game environment.

      MCRF200 and MCRF250 devices operate in the one  
21    hundred twenty-five kHz frequency band. They are read-only  
and are one-time programmable with a unique serial number.  
Hence, they can be used to represent many different tagged  
play objects. Up to ninety-six bits of serial number can  
be programmed, supporting trillions of unique  
26    identification codes.

      Other RFID tags, using other types of signal  
modulation (e. g. AM, AM/PM, FSK, Direct PSK (change on  
data change), PSK (change at the beginning of a one)) and  
data encoding methods (NRZ Direct, Differential Bi-Phase,  
31    Manchester Bi-Phase, Bi-Phase IDI) suitable for required

1 error detection and correction capability may also be  
used.

Other frequency bands may also be used. RFID tag  
devices such as the iCode from Philips Semiconductor and  
the MCRF 355/360 and MCRF450 from Microchip Technology Inc  
6 are but two examples of devices operating in the 13.56 MHz  
radio frequency. Other RFID tag systems operate at SUHF  
frequencies in the five GHz range, such as devices  
manufactured by Hitachi.

If read and write features are desired, i. e. be able  
11 to write and update information in the play object,  
MCRF450 from the same company may be used.

While some RFID systems operate using primarily  
inductive coupling of the power and signal energy from the  
master unit reader/interrogator to the RFID tag IC, other  
16 RFID technologies use primarily capacitive coupling. For  
example, the BiStatix RFID devices from Motorola use  
capacitive coupling.

In embodiments of our invention, either inductive or  
capacitive coupling can be used - depending on the toy or  
21 game and the nature of the play objects being recognized.  
For example, a capacitive coupling element (antenna) can  
be formed by printing two surfaces with electrically  
conducting ink or other substance onto paper, plastic,  
cardboard, or other non-conducting material. These two  
26 surfaces form the two plates of a capacitor, which  
performs the signal and power energy coupling between the  
host and the RFID tag object. This method can be used to  
"print" smart trading cards, playing cards, collecting  
cards, or other flat, generally two-dimensional type  
31 objects.

1           Other chips or devices that support the functional-  
ties and features described herein may be used in making  
the master/host/server and the play objects. Furthermore,  
there are many possible configurations of electronic  
circuits for RFID reader/interrogator devices and play  
6           objects. For the purposes of electronic toy and game  
playing systems, the cost of the electronic components  
generally must be very low, typically costing under five  
dollars.

11           User presentation, such as visual or audio outputs,  
may also be implemented by coupling such reader/inter-  
rogator circuits with appropriate display and/or audio  
circuits. Master/host/server or master units, for  
example, may include various visual display mechanisms,  
such as colored light indicators (typically LED devices),  
16           and alphanumeric display screens such as formed by LCDs  
(liquid crystal display), LEDs (light emitting diodes),  
and in dot matrix or custom graphic "icon" formats. Such  
displays convey text and numerical information including  
words, statements, or other visual information. User-  
21           presentation depends on the instructions contained in the  
program controlling the microprocessor.

26           In the case that the master/host/server or master  
unit has multiple antennas, switching circuits are used to  
enable or disable individual antenna elements. This is  
done under the control of the control program. The  
control program can also sequence the various antennas to  
determine if play objects are/are not placed in certain  
locations, and respond accordingly. This is generally  
31           dependent on the play-pattern or game environment  
enforced.

1       The exchange of power and data signals between the  
reader/interrogator and the play objects occurs rapidly,  
typically within one hundred through three hundred milli-  
seconds for one hundred twenty kHz carrier frequencies of  
operation, and within under one hundred milliseconds for  
6       thirteen MHz carrier frequencies, if not faster. RFID tag  
systems operating at thirteen MHz or five GHz have much  
faster response and data exchange timings because of the  
higher carrier frequencies.

11       Thus, the response time of a master unit to play  
objects may appear to be almost instantaneous as far as  
human perceptual speeds are concerned. This also means  
that multiple antennas and coupling devices can be  
switched and multiplexed quickly such that the response of  
the master unit appears to be instantaneous by human  
16       perceptual speeds.

Referring to Fig. 3, antennas, particularly for the  
master unit, are preferably oriented orthogonally with  
each other and multiplexed or fed with complimentary RF  
21       signals. This enables detection of play objects in case  
the coupling antennas are at obtuse angles and enables the  
RFID reader/interrogator to read and interrogate a passive  
RFID tag with coil in any angular position within the  
sensing field.

26       With a single loop antenna, the RFID tag IC and its  
antenna must be closely coupled to the signal field so  
that sufficient RF energy is coupled to power and  
communicate with the RFID tag device. For toys and games,  
however, there may be situations in which a single loop  
31       antenna is not able to recognize a small RFID tag device,  
that is, if the RFID tag device is orthogonal to the

1 master unit loop antenna, energy coupling would be  
minimized and the tag IC would not be recognized.

Thus, a second loop antenna oriented at ninety  
degrees to another antenna is preferable. The  
multiplexing method of selectively enabling and disabling  
6 multiple antennas (discussed further below) may then be  
used so as to ensure maximum signal coupling to the RFID  
tag at any angle within the sensing field. A third or  
more antenna can be added to the setup in a similar  
manner, at other angles to the detection area or space, so  
11 as to maximize the RF coupling efficiency to the tag IC  
without regard to a specific orientation of the play  
object in three-dimensional space.

In one embodiment, a master unit reader antenna is a  
coil of wire or a conductive printed loop of thin copper.  
16 The antenna is preferably tuned to the reader/interrogator  
circuit by a series or parallel capacitors.

The size and dimensions of the antenna and its  
electrical Q factor determine how sensitive the  
reader/interrogator antenna is to weak RFID-tagged play  
21 objects and how efficient such antenna is in converting  
electrical power into the RF energy to implement or  
trigger the play object-detection. The design of antennas  
in the master unit, as well as in the play objects, thus  
are considered. In one embodiment of the invention, an  
26 antenna is formed by making a six-inch diameter loop  
consisting of twenty turns of #32 enamel insulated copper  
having a low-series resistance. This antenna is then  
placed over the head of a toy doll, for example, enclosed  
within a plastic sheath so that it appears to be a hair  
31 band or head band fashion accessory.



1        Loop antennas could also be placed within and  
disguised in such things as necklaces, lockets, bracelets,  
belts, sashes, or other parts of a doll or the master unit  
itself. This loop antenna can also be placed inside the  
plastic head of a doll. Diameters of antenna loops may  
6        also be varied depending on where in the master unit,  
e. g. head versus hand, the antennas are going to be  
placed.

      The term "antenna" includes specific RF energy and  
signal coupling devices and elements, such as small or  
11       large coils or loops of wires or RF conducting materials  
in the case of inductively-coupled signals, surface  
electrodes in the case of capacitively coupled signals, or  
other combinations thereof. The size and value of the  
antenna may be as large or small as practical or as  
16       required by the play pattern or game.

      Even if multiple antennas are used, only one master  
reader/interrogator controller may be required (Fig. 4).  
For example, if four antennas are used 410, 412, 414, 416,  
21       they only need to be coupled to one reader/interrogator  
such as the HTRC110 HiTag reader 408 from Philips.

      This exemplary circuit uses four antennas and eight  
MOSFET transistors to selectively enable and disable each  
antenna by way of four digital control signals D1, D2, D3,  
26       and D4 418, 420, 422, and 424. The group of eight  
transistors forms a DP4T (double pole, four throw)  
electronic switch with very low "ON" impedance and very  
high "OFF" impedance. The four digital drive lines 418,  
420, 422, and 424 originate in the control of the  
31       microcontroller and are buffered by logic inverters to

1 switch the MOS transistors, which are biased by VDD at  
five VDC and Vss at ground level.

Furthermore, each of the four output pairs to each  
antenna may contain an additional fine tuning capacitor  
(C1 through C4) 426, 428, 430, 432 so as to provide the  
6 highest Q of the circuit for maximum energy transfer. In  
this exemplary circuit, one and only one antenna is  
enabled to be active at any given time. This circuit,  
however, may also be use to activate one or more antennas  
simultaneously with each other.

11 The TX1 434 and TX2 436 signals from the HTRC110  
RFID reader IC 408 feed into and are received from the  
common two signal lines normally used for a single  
antenna.

16 Referring now to Fig. 5, HTRC110 RFID HiTag  
reader/interrogator IC is used as an exemplary IC1 560.  
An RSC-300/364 chip IC2 562 is used as a voice/sound  
generator and synthesizer.

21 The RFID reader IC 560 includes a four MHz quartz  
crystal or a ceramic resonator (XTAL 1) 574 for timing of  
the RFID chip 560. The main antenna L1 in the form of an  
inductive loop provides energy and signal communications  
with RFID tag devices (play objects) within its field of  
operation or detection area.

26 A tuning capacitor for output signal is also part of  
the chip 560 to adjust resonant frequency of output for  
optimum Q. Furthermore, couples receive energy signal  
back from RFID tag modulation into the RECEIVE signal  
processing circuits of the RFID reader chip 562.

31 The RSC-300/364 IC 562 is an eight-bit RISC  
microprocessor with digital input and output, audio signal

1 output from internal sound synthesizer, data memory, and  
program memory. This IC 562 is powered 564, for example,  
by four AA Alkaline batteries or other source of four to  
six VDC power.

6 An ON/OFF switch SW1 566 to turn the IC ON or OFF is  
also available. A speaker SPKR 568 is used to output  
audio information (e. g. voice, music, and sound effects).  
This chip 562 contains an audio output amplifier to drive  
the speaker 568, in this case, a two-inch diameter sixteen  
to thirty-two ohm impedance speaker.

11 An audio output filter capacitor COUT 570 is also  
included for better quality. A fourteen MHz crystal (XTAL  
2) 572, which may also be used by the main clock of the  
CPU, is also available. Port zero lines PO1, PO2, PO3 578  
are included for digital input/output control of the RFID  
16 reader by the CPU. A reset circuit 580 is also available  
to provide proper reset of CPU at power on.

Similar to the master/host/server 103 described above  
(Fig. 2), a master/host/server in another embodiment (Fig.  
21 6) includes a visual display generator/controller 602 that  
controls a visual display. This way a toy may be  
responding not in audio form but in visual form.

The visual display 604 is generally used for user  
presentation and may include LEDs, OLEDs (organic light-  
26 emitting diode), LCDs, CRTs, incandescent lamps, 3D  
holographic or 3D stereographic displays, and other types  
of display technologies.

The visual display elements 604 may be single lights  
in various colors or white lite, alphanumeric LED or LCD  
31 displays, and fully dot matrix and raster type displays in  
monochrome or color screens, capable of showing numeric

1 and alphabetic characters in many different fonts and  
languages, and full pictures and motion video and  
animation type images. Using 3D displays also supports  
fully synthetic images, such as holograms or stereographic  
displays. Motion color videos and film images of  
6 photographs, action scenes or any other types of visual  
displays such as are seen on TV and movie screens may also  
be supported.

Visual display-driver integrated circuits 602 are  
commercially available from many companies, including Sun  
11 Plus, Microchip, Toshiba, National Semiconductor Corp,  
Texas Instruments, and many others.

For example, the SPLD801B LCD segments driver and  
companion SPLD802A LCD commons driver from Sun Plus may be  
used. Each of these IC can drive eighty segments or  
16 eighty columns for multiplexed LCD displays forming dot  
matrix images in arrays of eighty by eighty, or more  
pixels. These displays can form numbers, letters, icon  
graphic images, and other visual information. This type of  
LCD display driver typically interfaces to a controlling  
21 microcontroller unit via a few serial data, clock, and  
control lines.

Other LED displays can be driven with just bit output  
lines from the microcontroller driving an LED indicator  
light, or via a 2N2222 type transistor to boost the  
26 current. Incandescent lamps may also be driven this way.

In one embodiment, with just eight output pins from  
the microcontroller to drive LED anodes and another eight  
pins to drive LED cathodes via 2N2222 transistors to boost  
current, an eight by eight (8 x 8) matrix of LED lamps can  
31 be driven in scanned multiplex mode to display  
alphanumeric characters.

1           In another embodiment, Motorola MC144898 five channel  
LED/twenty five lamp driver can be used alone or in groups  
to drive a number of LED lamps in single or dot matrix,  
alphanumeric configurations. Using IC devices for CRT  
controllers or LCD display controllers, full large screen  
6 video or LCD displays in monochrome or color can be  
operated.

          A number of IC devices manufactured and marketed by  
Epson Semiconductors can support CRT or LCD displays, or  
both, in embedded systems. Some examples are SPC8106 VGA  
11 LCD/CRT Controller, SED1330 LCD Controller, SED1353 LCD  
Controller, SED1354 LCD/CRT Controller, SED1355 LCD/CRT  
Controller, SED1356 LCD/CRT/TV Controller, SED1374  
Embedded Memory LCD Controller, and SED1375 Embedded  
Memory LCD Controller.

16           In another embodiment, a microcontroller can control  
both a visual display generator/controller and a voice and  
sound generator. This way a toy may be designed to have  
both visual and audio user presentation.

21           Referring now to Figs. 7A and 7B, in still another  
embodiment of the invention, RFID tag ICs 708a and  
suitable antenna 708b can be embedded inside of play  
objects 708 in the form of small play blocks molded from  
26 plastic, carved from wood, or other non-conducting, non-RF  
shielding materials. The master unit and control engine  
703 is contained inside of a large tablet-shaped form 701.  
The engine 703 includes the sensing antenna coil 705 in  
the surface 709, a reader/interrogator circuit 707, a  
31 microcontroller 713 with voice/sound generator IC, an

1 audio amplifier and speaker 721/723, and batteries 725,  
similar to the arrangement shown in Fig. 2.

The "magic tablet" 701 can recognize the play blocks  
708 placed on it. The play blocks 708 may have printed or  
molded legends 708d on one side of the cube, such as  
6 letters of the alphabet, numbers, arithmetic signs such as  
+, -, / and X, or pictures or icons of animals such as  
cows, horses, chickens, or pigs, or other objects such as  
musical instruments, musical notes, or other things.

The magic tablet 701 has a similar "engine" 103 as  
11 the dolls described above. The control program could  
operate in many different modes.

In speaking only, the tablet voice just says the name  
of a letter or number block placed on it. If a number of  
blocks are placed on the tablet, using anti-collision  
16 techniques, the master unit 703 accordingly identifies and  
processes all the blocks placed.

The magic play blocks 708 and tablet 701 may have  
complementary Velcro, or possibly magnetic, surfaces 710a,  
710b for establishing a preferred orientation of each  
21 block and its antenna 708b to the tablet and its antenna  
705 so as to maximize the RF energy transferred between  
the master unit and the RFID tag IC 708a and antenna 708b  
contained inside the block or object 708 placed on the  
magic tablet.

26 Alternatively, referring to Fig. 7C, the play block  
or object 758 could contain the RFID tag IC 758a and small  
loop antenna coil 758b in a diagonal orientation inside  
the play block or object, so that regardless of the play  
block or object orientation to the tablet surface 709, the  
31 loop coil antenna 758b inside the play block or object  
will couple sufficient RF energy to the associated RFID

1 tag IC 758a in that play block for proper operation with  
minimal transmitted power.

The tablet 701 can also ask a child to spell a word  
such as "DOG" and then detect when the correct letter play  
blocks 708 have been placed on the tablet, and speak  
6 accordingly, correct or not, to help teach a child how to  
spell. In this embodiment, the locations or positions of  
where the blocks are placed are not considered.

In one embodiment, the word "DOG" is spelled  
correctly when a child places the correct letter one after  
11 another, i. e. "D" then "O," and then "G." How the  
blocks are placed on the tablet does not affect how the  
RFID reader/interrogator reads the data contained in the  
RFID tag IC, so long as the play letter object is in the  
detection area of the RFID reader/interrogator.

16 In another embodiment, a child may place all three  
play blocks ("D," "O," and "G") at the same time to  
correctly spell the word "DOG." Still in another embodi-  
ment, the order of when the letter blocks are placed is  
irrelevant so long as the correct letter blocks are  
21 placed.

Detection of multiple play blocks or objects 708 is  
again accomplished by the control program of the  
microcontroller 113 and the reader/interrogator circuit  
707. Data that are exchanged, that is transmitted by the  
26 RFID tag and read by the reader/interrogator, are actual  
digital bits of data and not just resonance frequencies.

The circuit of the reader/interrogator 707 operates  
at the selected RF frequency of the RFID tag IC 708a and  
antenna 708b. Commonly used frequency ranges are 100-150  
31 kHz, or 13.5 MHz nominally, or other frequencies.

1       The specific methods of data modulation used in a  
specific RFID tag system are not of consequence to the  
inventions of toys and games. The basic operation of the  
invention can be adapted to various modulation methods and  
frequency ranges, depending on the cost of the circuits  
6       and the range of operation.

      It is very important to note that the detailed  
control of the reader/interrogator circuit and the data  
transmission and reception is highly dependent on the  
control of the reader/interrogator circuit which is  
11       effected by portions of the operating system and drivers  
contained in the main "engine."

      The disclosed master/host/server toys or game units  
can deal with detecting multiple play objects i.e., where  
more than one play object are presented to or removed from  
16       the toy or game master.

      For example, a doll 110 can ask to "see" three shapes  
in flash cards or play objects 108 containing suitable  
RFID tag ICs 108a. Then the doll can ask for one of the  
shapes or objects 108 to be removed. If the incorrect one  
21       is removed, the doll will recognize that, and speak a  
suitable warning response.

      Because a considerable amount of power is consumed  
with the activation of the reader/interrogator circuit 107  
to transmit RF energy to detect the possible presence of  
26       an RFID tag IC 108a within the range of the mas-  
ter/host/server toy or game unit, such operation must be  
managed carefully. The master control program can manage  
the activation of the reader/interrogator circuit 107 on a  
time-multiplexed basis, so as to conserve power in  
31       operation and therefore prolong the battery life of the  
toy or game.



1           For example, the discussed apparatus provide for the  
time-multiplexed activation of the reader/interrogator  
circuit 107 on a time interval basis to conserve battery  
power. Rather than leave the reader/interrogator circuit  
107 activated on a continuous basis, the master/host/ser-  
6       ver or master unit 103 only activates this circuit 107  
very briefly a few times per second, until a suitable RFID  
tag IC 108a is found to respond. In this manner, the  
method of control reduces the power consumption by a  
significant amount, and extends the battery life of the  
11       toy or game unit.

Referring now to Figs. 8A and 8B, there is shown a  
smart trading card master device 803 in the form of a  
hand-held reader for smart trading cards or flash cards  
16       808. A trading card 808 can be slid into a mechanical  
slot 812 provided for the purpose of holding the card 808  
in place, the card can be placed on the surface of a hand-  
held reader, the card can be waved in front of a table  
(e. g. Figs. 7 or 13), or via other means for read/write  
21       detection and operation by the master unit.

The reader 803 has a reader/interrogator circuit 807  
and antenna 805 for communicating with the RFID tag ICs  
808a embedded within the trading or flash cards 808. The  
trading card control master (master unit) 803 can read and  
26       write back selected data information to and from the RFID  
tag IC 808a embedded in the trading card 808. This is  
performed under the control of a single chip microcontrol-  
ler 813 which includes a speech/sound synthesizer circuit  
819 with digital to analog converter suitable to drive  
31       audible sounds from a miniature loud speaker 823 inside  
the unit.

1           Moreover, the microcontroller 813 can include the  
circuitry to drive segments and layers of a common,  
multiplexed LCD alphanumeric display screen 814 on the  
master unit, whereby information can be visually  
displayed. Power to the master device 803 may be provided  
6 by batteries 825.

          In addition, the microcontroller can include  
circuitry to communicate with an external device such as a  
personal computer, a hand-held computer, or other device,  
via a wired serial communications interface for RS-232,  
11 USB, IEEE 1394 or other standard or custom communications  
network.

          With such a network communications link, information  
about the trading cards, their values, ownership, or other  
information can be communicated to other programs and  
16 services, and could also be conveyed via the Internet to  
various websites offering prizes, recognition, or other  
services to the card collector or game or toy player.

          In a text-to-speech application of the invention,  
words and phrases can be encoded in the tag IC memory in  
21 the form of ASCII or other generally known and used  
character encoding techniques by using RFID tag ICS with a  
sufficient number of data bits or read only or read/write  
memory.

          For example, the word "HOUSE" can be encoded in 6-bit  
26 ASCII code, that is six data bits per alphanumeric  
character, using a total of only thirty data bits. The  
RFID tag IC containing this data bit pattern could be  
embedded inside a flash card, a trading card, or any other  
small two or three-dimensional object.

31           Upon detection and query of the flash card, trading  
card, or other object by the doll, a reader or other

1 master unit toy or game unit, programmed to recognize the  
encoding of words, the five letters of the example word  
"HOUSE" would be received and then conveyed to a software  
program and/or combination of software program and voice,  
sound or speech synthesizer, in any of many various  
6 languages, to be converted into the spoken word "HOUSE" by  
the toy or game unit.

A very important feature of this embodiment of the  
invention is the ability to form hundreds, thousands, or  
even millions of unique identity flash cards, trading  
11 cards, or other play and collectible objects containing  
RFID tag ICs, which then cause the master unit toy or game  
unit to speak, or to display and speak, the word or words  
programmed within them. This is significantly different  
from using a master unit toy or game unit that has a sound  
and speech voice synthesizer using only pre-recorded words  
16 or phrases of language, which would be activated by  
control and behavior programs in the toy or game unit.

In the foregoing embodiment of the invention, there  
can be a virtually unlimited range or spoken words and  
21 phrases, activated by one or more suitably programmed RFID  
tag ICs contained in flash cards, trading cards, or other  
objects. As noted above, if desired, the major portion,  
if not all, of the spoken or displayed data may come from  
the object's memory. The main advantage of this  
26 implementation is that the toy or game unit does not have  
to be completely pre-programmed with all the words it  
might ever have to speak or say or display. Rather, the  
toy or game unit need only have a text-to-speech converter  
program in its control program, with proficiency in one or  
31 more spoken languages. Such a toy or game unit could be  
of use in learning and teaching various languages.

1       The number of data bits in the RFID tag IC, perhaps  
as many as one thousand bits, could contain as many as 150  
alphanumeric characters, (i.e. letters, numbers,  
punctuations, and other control codes) sufficient so that  
one flash card, trading card, or RFID tag IC equipped  
6       object, could cause the doll, master unit toy or game unit  
to speak a specific sentence or sentences of multiple  
words and phrases.

11       In another preferred embodiment of the invention  
(Fig. 9A), a hand-held game device 920 receives an RFID  
reader cartridge 904 and a game cartridge 902. The hand-  
held device 920 typically includes a microcontroller, a  
visual display 924, e. g. an LCD or LED, sound-generation  
circuits, an audio output speaker 926, and control buttons  
16       922.

The RFID reader cartridge 904 is preferably a plug-in  
accessory that fits into hand-held video game devices such  
as NINTENDO® GAME BOY, NINTENDO® GAME BOY ADVANCE, and  
other types of programmable hand-held game and computing  
21       units. This plug-in accessory may also be designed to fit  
into hand-held computing devices like PALM computers,  
PDAs, and even with console video games units like SONY  
PS-2, NINTENDO GAMECUBE, MICROSOFT XBOX, etc.

26       The RFID reader cartridge 904 includes RFID  
reader/interrogator circuit(s) 908, antenna(s) 906, and  
control/interface circuit(s) 910 to the hand-held device  
920, particularly to the main bus. The antenna sensing  
elements 906 preferably protrude out or are placed on the  
rear side of the RFID cartridge 904, and preferably formed  
31       as loops.

1           The RFID cartridge 904 is generally plugged into an  
interface or slot 928 available in the hand-held device  
920. This interface 928 is generally where game  
cartridges are plugged in or inserted. For NINTENDO® GAME  
BOY ADVANCE, for example, the game cartridge or game pack  
6 is plugged or inserted at the back of the unit. This  
interface or slot 928 includes multiple electrical  
connections to supply operating power to the game  
cartridge 902 and the RFID reader cartridge 904 and for  
connecting address, data, and control signal lines or  
11 generally to the main bus.

          The RFID reader circuit 908, with the antenna 906,  
reads and writes information back to play objects 990.  
This play object 990 has at least one RFID tag circuit 994  
and an associated antenna 992. The play objects may be in  
16 many forms, including action figures, cards, and the like.

          The RFID reader cartridge 904 is preferably an  
intermediate cartridge which plugs into the hand-held  
device 920 via the interface/connector/slot 928 (Fig. 9B)  
The RFID cartridge 904 also includes a receiving  
21 interface/connector/slot 912 into which a game cartridge  
902 may be plugged-in.

          This connector/interface 912 is generally a pass-  
through interface so that the game cartridge 902 is able  
to convey all program code and data to the hand-held  
26 device 920. The control circuits 910 is generally used  
to interface input/output controls to the hand-held device  
920.

          The game cartridge 902 contains the play-patterns or  
"the game" that is going to be played by a user. It  
31 typically includes a memory chip, such as a read-only-  
memory (ROM). The ROM contains the operating program and

1 data patterns for graphics, sounds, animations, and game  
play.

The RFID cartridge 904 also includes interface  
circuit(s) 910 to the main bus of the hand-held device  
920. Instructions on how to process the information read  
6 by the RFID reader circuit 908 are also contained in the  
game cartridge 902. Such RFID instructions control how  
information read by the RFID reader 908 is processed  
within the game.

In this embodiment, a multitude of games or play-  
11 patterns may thus be designed to work with various play  
objects. Playing video games on hand-held devices is thus  
enhanced with the introduction of RFID reader cartridges  
and RFID play objects.

These RFID play objects may contain serial numbers,  
16 identity numbers, or other types of information such as  
those related to the object or to the game in general.  
This information may thus affect how a game is played.

For example, as a user holds an RFID action figure  
play object 990 and passes it over or near an antenna 906  
21 (i. e. the figure is in a detection area), the RFID reader  
908 reads the contents of the RFID tag ICs 994. This  
information may then enable this character in the game  
(i. e. bring this character into the game), alter  
attribute values, such as strength and hit points,  
26 instruct the hand-held device 920 to say "Hey, it's  
Superman!," alter the logic of the play-pattern of the  
game, give clues to the users, extend playing time, and  
the like.

The RFID reader cartridge 904 may obtain its power  
31 from the hand-held device 920. It is also possible that

1 the RFID cartridge 904 has its own source of power, such a  
battery that is part of the RFID cartridge 904.

In another embodiment of the invention, the hand-held  
game or computing device has an integrated or built-in  
RFID reader/interrogator under the control of a  
6 microcontroller or a processor. Thus, the RFID cartridge  
904 is thus unnecessary. A game cartridge with the  
desired play pattern or game needs to only be inserted  
into these hand-held game devices. The program contained  
in this game cartridge dictates how the processor controls  
11 the RFID reader/interrogator circuit. The antenna  
associated with the RFID reader/interrogator may be placed  
in various location of this device, such as front or back  
of the unit.

In another embodiment of the invention, instead of a  
16 hand-held game device, a video game console unit 930, such  
as an Xbox unit of Microsoft Corporation or a PlayStation®  
unit of Sony, is connected to a television console 932.  
The video game unit 930 is connected to the tv via a wire  
interface 934.

21 The video game unit 930 has a built-in or integrated  
RFID reader/interrogator 940 and an associated antenna  
948. It also includes a processor 942. The game or play  
pattern that is going to be played is contained typically  
in a readable medium 936, such as a CD-ROM. It contains  
26 the program of the game.

The software or program 936 is loaded into a program-  
receiving unit 938, such as a CD reader. In conjunction  
with the processor 940, the instructions contained in the  
program are executed by the processor or by appropriate  
31 components typically under the control of the processor.

1 The RFID reader/interrogator circuit may also be under the control of the processor.

The program or software 936 may also be received by the video game unit 930 via a connection, such as the Internet.

6

RFID tagged play objects may be waved or placed near the game 930 and accordingly recognized and processed under the rules of the game. User presentation such as visual display and audio output are presented by the connected television or display unit 932.

Alternatively, the RFID reader/interrogator 940 and associated antenna 948 is not integrated with the game device 930. In this scenario, an RFID reader cartridge is plugged into an available port in the game device 930. The program 936 loaded into this game device and the processor controls the RFID reader/interrogator including how data read should be handled.

In another embodiment, a hand-held game or computing device 950, such as an iPaq unit from HP or a PDA, includes a visual display 954. It also includes an RFID reader/interrogator 960, an antenna 952, a processor 962, a speech/sound synthesizer 964, and a speaker 966. The game program may be preloaded into this hand-held unit or be downloaded into this unit via other means, such as a connection to the Internet or a connection to a software/program media reader. User presentations are all handled by this same unit 950.

Alternatively, the RFID reader/interrogator is not integrated to the system but is available as a plug-in accessory. As devices become popular, they, however, become integrated into the system, like Ethernet cards are



1 now becoming standard devices built-in into computer  
laptops and notebooks.

Thus, in general, in this type of game/computing  
devices, the RFID reader/interrogator may be built-in or  
integrated in the game/computing device, or may be  
6 available as an accessory to be plugged in or connected to  
the main game/computing device. User presentation may be  
presented by the game/computing device itself and/or by  
external devices connected to such game/computing device.

11 Referring to Fig. 10A, in one embodiment, these play  
objects containing RFID tag ICs are manufactured  
containing initial ownership status information 1004.  
This initial status information may be in several forms,  
e. g. a bit "0" indicating that this object has never been  
16 owned, a series of blanks or nulls indicating no owner-  
ship, or a textual field with "never been owned" written  
on it.

Initial value information, for example, play  
currency, hit points, strength level, character level,  
21 name, etc. may also be stored as part of the play object  
1004. This value or set of values, including status  
information, may be numeric and/or nonnumeric.

Once a play object is purchased for the first time,  
the store using a master/host/server (transactor 1033 Fig.  
26 10B), i. e. capable of handling transactions, including  
writing to play objects, updates the play object with new  
ownership information. This master unit or transactor  
1033 is coupled to an input device 1044 enabling the  
purchaser of that play object to enter ownership  
31 information, such as name, address, and phone number.  
This input device 1044 may be a keyboard, a touch screen,

1 a computer, a voice-activated input device, or any input-  
enabling device. Other master units able to handle this  
type of transaction may also be used.

Once the purchaser provides his or her ownership  
information, the master unit transmits and writes this  
6 information into the RFID tag ICs of the purchased play  
object 1006 (Fig. 10A). Security information 1008, such  
as password, is generally also entered by the user so that  
future ownership information may only be written into that  
play object if a proper password is provided. This  
11 password is also stored in the play object.

Other values of the play object may also be updated  
according to the play-patterns programmed in the master  
unit 1010.

In the future, if the owner decides to trade or sell  
16 this particular play object to another person, the owner  
may do so by using a master unit. The owner may use any  
master unit that is capable of handling this type of play-  
pattern transaction.

To enable the transfer transaction, the current owner  
21 enters the same password previously stored in the toy.  
This security information is verified by the master unit  
1012. This is done assuming that the play object is  
within the area of detection, i. e. the RFID  
reader/interrogator communicates with the RFID tag ICs of  
26 the play object.

In more detail, the RFID reader/interrogator of the  
master unit reads the RFID tag ICs of the play object -  
particularly the password. The password entered is then  
verified against the information read. This is done by  
31 the microcontroller, under the control of a program.

1           If the password entered matches the one stored, the  
master unit enables the new owner to provide new ownership  
information and security information via an input device.  
This new ownership information and security information  
are stored in the RFID tag IC of the traded play object,  
6       for example, card 1014, 1016.

          Password security thus ensures that only valid  
transactions are written into the play objects. Theft and  
illegal possession of play objects are thus alleviated.

          This process may be repeated if the play object is  
11       later on transferred to another owner. Ownership  
information history may also be stored thus enabling users  
to see its history. Other types of information may also  
be stored in play objects, including numeric values (e.  
          g. monetary values), alphabetic values, and nonalphabetic  
16       values. With the transfer, values of the play object may  
also be updated according to the rules or logic of  
handling such transactions 1018.

          Non-face-to-face exchanges and trades may also be  
done. The current owner may send the play object and the  
21       valid password to the new owner. The new owner may then  
use an available and appropriate master unit to store new  
ownership information. The new owner does this by  
supplying the valid password and new ownership informa-  
tion.

26  
  
          In one embodiment, each play object is associated  
with a card, like an ATM (automated teller machine) card.  
This card contains information about the play object or  
collection of play objects owned, for example, by an  
31       individual. To exchange play objects, each owner only has  
to wave the card or place the card near the master unit or

1 master/host/server to effect the transfer and enter the  
appropriate security or PIN information. This way, owners  
can have their collection information in one master card.

Alternatively, each play object may have its own  
associated card containing ownership information about  
6 that play object, similar to having a birth certificate or  
a car registration form

A master unit may handle the transfer of more than  
one type or product line of play objects. Meaning that a  
11 master unit may handle various play objects so long as the  
master unit 1033 (Fig. 10B) is able to read/write  
information from the RFID tag ICs of the play objects.  
This means that play objects may be sold without  
corresponding master units 1033. So long as a user has  
16 access to an appropriate master unit, exchanges and  
transfers may be done.

In another embodiment, all master units, regardless  
of the play-patterns or game processed, can handle  
exchange and transfer transactions of all or a number of  
21 play objects. This may be done, for example, by having  
certain information be stored in these play objects. In  
another embodiment, only certain master units handle this  
type of transaction, e. g. exchanges and transfers.

A master unit 1033, handling transfers and exchanges,  
26 generally has an antenna 1032, a display 1042, an RFID  
reader/interrogator 1034, a speaker 1040, and an input  
device (keyboard) 1044, (microphone) 1052 .

In doing exchanges, for example, the play object or  
the container of the play object 1002, 1004 contains the  
31 RFID tag IC. To initiate an exchange, the owner of each  
respective action figure enters their user name and

1 password 1050, 1052. The master unit 1033 processes this  
information. If the information entered is correct, the  
RFID tag IC of each respective play object or container of  
each respective play object is updated accordingly to  
reflect new ownership information.

6 Values, such as money value, play currency value,  
strength, hit points, and the like are associated with  
each action figures. This information and values depends  
on game or play-pattern designs and thus may also be  
accordingly updated during the exchange function.

11 Information and values may also be updated and revised by  
connection via a master unit to a network, the internet,  
store point-of-purchase registers, and the like.

16 In another method of trading, exchange, or processing  
of play object or variable play substance information  
(e. g. exchange of play money), each play object 1002,  
1004 is associated with a master control card 1050, 1060.  
Each play object 1002, 1004 also contains a unique serial  
number or any other identity-type information in its RFID  
21 tag IC. The master control card also contains an RFID tag  
IC and an antenna. The RFID tag IC also contains the  
serial number of the associated play object. Preferably,  
the master control card also contains a personal  
identification number (PIN) so that unauthorized transfers  
26 or trade are prevented.

To initiate the process or transfer, the owner of the  
action figure, for example, action figure 1 (1002), waves  
or places his or her master control card 1050 over the  
transactor master unit 1033. The owner then is prompted,  
31 via a user presentation display, to enter his or her PIN.  
The owner enters the PIN via an input device, such as a

1 keyboard 1044 or microphone (voice commands) 1052. Once  
the user enters the proper PIN and is verified by the  
master unit 1033 by reading the RFID tag IC of the master  
control card, the new owner is then prompted to enter a  
new PIN. The master control card 1050 associated with  
6 action figure 1 (1002) is then asked to be waved over the  
master unit 1033 so that the PIN of the new owner may be  
written into the memory of the tag IC. Optionally, action  
figure 1 (1002) may also be asked to be waved over the  
master unit 1033 so that information, e. g. transfer  
11 history, new PIN, variable play substance information  
change, and the like, may be written into the tag IC of  
the traded or exchanged action figure 1.

It is also possible that variations on this operation  
may be made, for example, no PIN is required, owner  
16 personal information is written into the processed play  
object, ownership is not changed but only variable play  
substance information (e. g. transfer of virtual play  
money), additional master control cards are needed, etc.

21 In still another embodiment of the invention, a game  
or toy 1100 (Fig. 11) includes a master unit in the form  
of a toy car or toy moving vehicle and several play  
objects in the form of cards 1104, 1106, 1108 and three-  
dimensional objects 1110, 1112, 1114, with each play  
26 object containing one or more RFID tag ICs 1132 within  
them and a suitable antenna element 1134. The antenna of  
the master unit is preferably at the bottom of the plastic  
car 1102 and/or in the side of the car.

The game or play pattern is designed such that the  
31 vehicle 1102 makes an audio response as it recognizes each  
play object. This response, for example, includes "That's

1 the letter 'A'" 1104, "This is a turtle 1106," "That's a  
triangle," "What a pretty oak tree" 1110, music, sound  
effects, and the like.

In one embodiment, a child pushes or remotely  
controls the car 1102 to travel 1122 on a predefined track  
6 1116. The moving vehicle may also be self-powered. As it  
travels through the track 1116 and over each card, it  
recognizes the play objects, 1104, 1106, 1108, and  
accordingly generates and projects the proper audio  
presentation through the car's speakers.

11 In another embodiment, a child freely pushes the car  
1102 in an arbitrary path 1124, i. e. without a predefined  
track. As the car passes or comes near the play objects  
1110, 1112, 1114, the car generates the appropriate audio  
response, such as "What a pretty oak tree" 1110, "Oh,  
16 that's the bakery" 1112, "A rabbit!" 1114.

The car can also make other types of sound effects,  
besides speech, as well as activate other effects in the  
moving vehicle such as flashing lights, changing speed,  
turning motor on and off, and causing moving pieces to  
21 move.

As can be seen from the various embodiments of the  
invention, it is feasible that master units and play  
objects from one game may be used in another game, so long  
as data transmitted can be recognized and understood by  
26 the master unit being used. This means that numerous  
master unit and play object combinations may be created  
with minimal changes to the underlying master unit circuit  
and/or program.

31 In yet another embodiment of the invention, a game  
1200 (Fig. 12) includes a hand-held unit 1203, such as a

1 wand, scanner, or waver master/host/server or master unit,  
with an RFID reader/interrogator circuit and antenna, or  
portions thereof, within it. The hand-held unit may be in  
various three-dimensional forms. The antenna 1213 is  
around the open viewport of the hand-held unit 1203. The  
6 master unit toy 1203 also includes a microcontroller, an  
RFID reader/interrogator, and a voice/sound generator.  
The play objects each contain an RFID tag IC and at least  
one antenna.

As the child waves the hand-held unit 1203 over the  
11 play objects 1202-1214 with the RFID hand-held master unit  
ICs, appropriate responses are generated. Such response  
may include, "That's the letter W" 1202, "That's a black  
rabbit" 1204, "That's a star" 1206, "That's a green  
turtle" 1208, and "That's an airplane" 1210. These  
16 responses may be varied. The user presentation may also  
be varied, such as there could be additional visual  
presentation or visual effects displayed by the hand-held  
scanner unit, the hand-held unit can vibrate as each play  
object is recognized, pieces of the hand-held unit may  
21 move (e. g. dance), and the like.

Another play pattern can be that moving the RFID-  
tagged play object close to the hand-held unit or scanner  
1203 will activate a price charge in a toy cash register  
or store play set, like a retail supermarket check-out,  
26 etc.

The hand-held unit may also take another form.  
Instead of a wand, the master unit toy may be in the form  
of a glove, a hand-held puck or pod, a long stick, a rod,  
a pencil, and the like.

31 The antenna/energy and data-coupling element is  
located in the tip or end of the wand/rod — hand-held



1 element. This "sweet spot" can be waved and scanned over  
the tags.

Physical touching of the wand sensing element to the  
toy or game itself is also possible, for play pattern and  
play action value. The physical contact, however, is not  
6 required for signal and energy coupling, but is yet  
another means of play pattern in addition to waving,  
scanning, and other signal exchange methods.

In another embodiment, the master unit 1223 (Fig.  
12B) is not entirely housed in one object or toy. In this  
11 embodiment, the antenna 1233 and the RFID reader/inter-  
rogator are in the hand-held unit itself. Other  
components of the master unit, however, such as the  
microcontroller 1241 and the voice/sound synthesizer 1239  
are in another unit such as a box 1237. Power source may  
16 also be stored in this box 1237. The wand 1223 and the  
box 1237 are connected by a wired connection 1225. Thus,  
it is possible that the master unit engine be partitioned  
and housed in several entities and locations.

Due to RF circuit design, it is preferable that the  
21 RFID reader/interrogator circuit and the antenna or  
coupling element be in close physical proximity with each  
other so as to minimize detuning effects.

In an alternative embodiment, a play object 1250  
(Fig. 12C), in this example a toy doll, contains a number  
26 of RFID tag ICs and antennas 1252. Each RFID tag IC is  
associated with an antenna to identify a particular  
location or body part of the doll.

For example, if the hand-held unit 1203 is placed  
near or over certain areas, appropriate user presentation  
31 is generated. Examples of such response include "This is  
my nose" 1252, "This is my right arm" 1254, "This is my

1 right hand to hold a bottle" 1256, "This is my right foot"  
1258, and "This is my left foot" 1260. Instructions such  
as "Touch my nose," "Tickle my left foot," "Touch my arm,"  
and the like may also be included as part of the game.  
This play object may be used to teach children various  
6 body parts.

This play object may also be a game board with a  
number of RFID tag ICs, or any two- or three-dimensional  
play object with a number of RFID tag ICs in various  
locations of the object. When the movable hand-held unit  
11 is waved on this RFID-tagged locations, game instructions  
may be given in accordance with the game or play pattern  
played at that time. This hand-held unit thus may be  
fashioned as to look like a game controller or a playing  
piece.

16 In yet another embodiment of the invention, the  
master unit toy 1300 is a loop-like device. The game is  
designed such that various play objects are flown through  
the loop 1302. This loop also contains the antenna  
21 associated with the RFID reader/interrogator 1304. A  
voice/sound synthesizer 1306, a speaker 1310, a micro-  
controller 1308 are also housed in this toy unit.

To play this game, a child flies the RFID-tagged  
action figures 1132-1356 through the loop. The master  
26 unit toy 1302 accordingly generates the proper user  
presentation, such as audio responses. For example, the  
master unit says "Hey, It's Superman," "Show me Batman,"  
or "It a Firefighter," when the play objects 1354, 1356,  
1352 are respectively flown into the loop.

31 When the master unit detects more than one action  
figure 1352, 1354, 1356, for example, near the loop, a

1 battle play pattern may be initiated. For example, a play  
by play story, for example, "Superman took some three  
points damage," "Batman's strength went up by two," and  
the like may be presented to the users. The RFID tag ICs  
of respective action figures are also accordingly updated  
6 to reflect new or updated information due to the play that  
has ensued.

In another embodiment, the master unit toy 1333 is in  
table or box-like form. This toy 1333 includes an antenna  
1332, an RFID reader/interrogator 1334, a microcontroller  
11 1336, a speech/sound synthesizer 1338, and a speaker 1340.  
As the play objects are flown or passed over the table  
1333 the appropriate user presentation and update to the  
appropriate RFID tags are presented.

User presentation as applied to the many embodiments  
16 of this invention is not limited to audio presentation.  
Other forms, such as visual, tactile, and olfactory  
presentation may be incorporated in the master units.  
Appropriate components to handle such user presentation  
have to be incorporated in the master units.

21

The various embodiments of the invention discussed  
herein generally works in a game environment that includes  
a master/host/server or master unit and at least one play  
26 object with an RF tag IC. The game environment generally  
works in such a way that communication, particularly, data  
exchange, is generally established when the play object is  
in at least one detection area of the master unit for the  
minimum time required to complete a successful RFID trans-  
31 ponder data exchange, read, or read/write operation. This  
means that communication is established even if the master

1 unit is stationary and the play object is stationary, even  
if the master unit is stationary and the play object is in  
motion (e. g. waving or passing of an RFID-tagged flash  
card or play object in front of or around the dolls shown  
in Fig. 1), even if the master unit is in motion and the  
6 play object is stationary, and even if the master unit and  
the play object are both in motion.

To explain the above-mentioned features of the inven-  
tion, another embodiment of the invention is herein dis-  
cussed and shown in Fig. 14A. In this game environment, a  
11 master unit vehicle 1402, such as a tractor, may be moved  
by a child.

This vehicle 1402 contains an RFID reader/interroga-  
tor circuit and an antenna. This antenna is preferably  
placed at the bottom and/or side of the tractor. The RFID  
16 reader/interrogator is hidden inside the vehicle. A  
microcontroller containing a program and a speech  
synthesizer are also housed in this vehicle.

The tractor 1402 interacts with play objects 1404-  
1410. These play objects, for example, may represent  
21 things that a person sees in a farm. These objects may be  
placed by a parent around a young child so that the young  
child can play with the tractor and these play objects.

These play objects 1404, 1406, 1408, 1410 include  
RFID tag ICs and associated antennas. The RFID tag ICs  
26 contain information identifying the object. This set of  
information may include serial number, information to be  
digitally synthesized, and object name (e. g. "cow,"  
"pig," or "sheep").

In one play pattern, when a child moves the tractor  
31 master unit 1402 close to a play object, for example, the  
cow 1404 so that a communication 1414 is established

1 between the RFID reader/interrogator of the tractor and  
the RFID tag IC of the cow, the tractor responds, for  
example, by saying "Your tractor is in front of a cow.  
'Moo moo'" 1412. In this scenario, the cow is  
stationary/still while the tractor is in motion (Fig.  
6 14B).

Questions and instructions may also be part of the  
play pattern. Instructions may be given such as "Drive  
the car to the pig." The master unit may then determine  
if such instruction was properly carried out.

11 When a communication 1414 is established, the RFID  
tag of the cow 1404 transmits and receives information in  
the form of data bit streams to and from the tractor 1402.  
The RFID tag receives their operating power from the RF  
energy transmitted by the master unit at the same time as  
16 data exchange occurs.

This information is then processed by the micro-  
controller under the control of a program. Appropriate  
responses, as coded in the program, are accordingly  
generated. For example, the speech synthesizer may  
21 instruct the microcontroller, in conjunction with a  
speech/sound synthesizer, to generate or synthesize a  
statement 1412.

Alternatively, the child may also move the play  
object, e. g. cow 1404, near the tractor 1402 so that a  
26 communication 1414 between the cow and tractor is  
established (Fig. 14C). The tractor at this point is in a  
fixed or stationary position. The appropriate response  
1412 is generated similar to the scenario above.

The child may also hold the tractor 1402 and the cow  
31 1404 in each hand and slowly move them close together  
(Fig. 14D). Even though the tractor and the cow are in

1 motion, so long as a communication is established - i. e.  
the cow is in a detection position relative to the  
tractor, the appropriate response 1412 is generated by the  
tractor.

Furthermore, even if the tractor and cow are  
6 stationary (Fig. 14E), so long as they are placed in such  
a way that they communicate with each other, the tractor  
would recognize the cow and generate the appropriate  
response. The number of times a response 1412 is repeated  
depends on the instructions contained in the program  
11 controlling the microcontroller.

When a master unit toy, in this embodiment — the  
tractor 1402, is in a position to communicate with the  
object, the tractor 1402 is able to continuously recognize  
the object, e. g. the cow 1404. How often and how  
16 continuous this recognition occurs may depend on power-  
saving mechanisms contained in the master unit toy.

In another embodiment of the invention, a master unit  
vehicle interacts with a mat or a board displaying various  
21 artwork or pictures painted or drawn by various artists..  
Each artwork is associated with an RFID tag IC and at  
least one antenna.

A child may move the vehicle over the mat and when  
the vehicle is over or passes over an artwork (i. e. a  
26 communication is established), the vehicle recognizes the  
artwork and responds accordingly with voices/sounds or any  
other responses instructed by the program controlling the  
microcontroller of the master unit. It may for example  
identify the artwork, for example, "Van Gogh, Starry  
31 Night."

1           The cards may also contain shapes, numbers, and the  
like. The play-pattern may also involve just counting the  
cards recognized, for example, saying "We have seen three  
stars and two squares."

6           In still other embodiments of the invention (Fig.  
15), a master/host/server or master unit is embodied in  
several devices such as in a cellular phone 1502, a  
videophone 1504, or a computer 1506. These devices have a  
similar "engine" 103 as the dolls previously described  
11 (Figs. 1A and 1B). These various devices may be located  
in several places, such as the place where the play  
objects are purchased, the user's home, toy stores, etc.  
These devices also have a similar RFID reader/interrogator  
engine as the dolls, toys, and games previously described  
16 (e. g. Figs. 1 through 5).

          In one game play-pattern, play objects such as POKÉ-  
MON® cards with RFID tag circuits are read by such game  
units 1502, 1504, and 1506. The RFID tag ICs include read  
and/or write memory devices and may contain identity  
21 numbers, such as serial numbers, as well other-information  
about that card. It is similar to the play objects 108 in  
Fig. 2

          When these cards are read by the RFID reader/inter-  
rogator contained in these game units 1502, 1504, 1506,  
26 information about the cards are presented to the users,  
preferably in both visual and audio form. The information  
provided to the users may be those directly contained in  
the tag ICs of the cards themselves or may be provided as  
part of the program contained in the microcontroller.

31           The program may also contain other instructions such  
as role-playing game instructions enabling the characters

1 represented by the cards to compete in duels and in car  
races, embark in adventure fantasies, and other play-  
pattern activities and functions.

Play objects in this scenario thus may be purchased  
from various vendors and locations. A user may use any  
6 master unit that is programmed to recognize and present  
information about the play objects. The user is thus not  
compelled to purchase a master unit, but may borrow  
available master units, if so desired.

11 Children, and even adults, love to collect things  
such as cards, action figures, cars, and accessories.  
These collectibles may be made in the form of play objects  
containing RFID tag ICs, including at least one antenna.  
This way, when children are showing off their price  
16 collection, even if more than one child owns the same  
collectible item, e. g. the same POKÉMON® card, the  
ownership of each card is easily identifiable.

Other uses and benefits of keeping information as  
part of the play object are apparent and are handled by  
21 several embodiments of this invention.

A board game 1600 (Fig. 16) is yet another embodiment  
of the invention. This board game may have one to four  
players, or more, depending on the game rules programmed  
26 and selected for play. Each player has his or her own set  
of coins or tokens — each containing a read only or  
read/write RFID tag IC (play objects). The objective is  
to remove other coins off the game board or table. The  
board game is usually placed on a table.

31 Each player puts his or her coins on the table and  
flips a coin in turn. If a player succeeds in removing



1 other players' coins, those coins are now his or her to keep.

The board game 1600 generally contains a microcontroller 1619, a speech/sound synthesizer 1620, a speaker 1622, an RFID reader/interrogator 1616, and an antenna 1624. A control program controlling the microcontroller is also available. There could be one RFID reader/interrogator 1616 in each control box 1616, i. e. in each corner of the board. An antenna is associated with each RFID reader/interrogator 1604.

11 Variations on the number and placement of RFID readers 1604 may be implemented based on the play-pattern desired. For example, there could be more than four RFID readers on the board, a number of antennas are placed in the middle of the playfield 1610, and the like. There could also be four separate antennas, one located in each corner of the board. Each area may have a separate antenna, which can be multiplexed by a single interrogator. This way, the game can be played knowing which specific objects are in which specific location in the game board.

21 An example of coins that may be used is specialized POKÉMON® coins. These coins each contain an RFID tag IC and antenna. One of the play patterns involves having an audio response when a user puts a coin down or flips a coin. For example, when a player puts a Mew coin, the speaker projects "Mew!" When a Pikachu coin is flipped into the board, the user hears "Pika!." When a user flips a coin, the user hears "Hooray!"

26 The play pattern may also be such that within the game, each coin grows up and gets special powers

1 permanently. This can be done by reading and updating the  
RFID read/write tag ICs of appropriate coins.

For example, special powers may be added or increased  
if the experience points of the coin reach a certain  
predetermined value. This value is controlled by the game  
6 program.

During the start of the game or the new introduction  
of coins in the game, the coins, for example, are updated  
with initial value, such as initial hit points, power  
points, and special points. During the course of the  
11 game, for example, if a coin is detected in the out of  
field zone 1614 (detected by an appropriate antenna placed  
in this area), hit points are decreased, for example, by  
ten points. When the hit points become zero, the coin  
"faints" or loses.

16 If a coin is detected by an antenna placed at or near  
the danger zone, sound effects may also be played.  
Variations on different board games play pattern rules and  
design may be implemented using the features of the  
inventions described herein.

21 In still another embodiment of the invention, a board  
game 1700 (Fig. 17) has a number of RFID tag ICs 1722  
placed within the board identifying locations, letters,  
shapes, pictures, symbols, depictions, animals, fruits, or  
26 whatever is desired in the play pattern of the game. The  
play pattern of this game, for example, is the placing of  
hand-held units, such as three-dimensional items or tokens  
1704, 1702 over or near the printed pictures 1720 on the  
board 1730. This could be used as part of a guessing  
31 game, an adventure game, a role-playing game, and any  
other play pattern desired.

1           These hand-held three-dimensional items or detectors  
1704, 1702 are used to interact or play with the board and  
act as master/host/server units. Each three-dimensional  
detector 1704, 1702 generally includes an RFID  
reader/interrogator 1712, an antenna 1714, a processor, a  
6           program controlling the processor, and a speaker to  
project sound, speech, and sound effects. Each detector  
functions as a master unit such that placing or moving the  
item over a board location triggers the detector to  
respond with programmed sounds, music, and the like.

11           An RFID tag IC 1722 and an antenna 1724 are present  
underneath each printed depiction to identify the location  
or the picture. This way, when the detector master units  
1702, 1704 are placed on the game board, the detectors can  
respond by saying if the tokens are placed in the correct  
16           locations. Variable play substance information, such as  
the number of times a detector is placed properly on a  
picture, is written into the memory associated with the  
RFID tag IC. In general, the detectors move about the  
game board and can detect tags at certain locations, thus  
21           affecting game play, variable play substance information,  
points, sounds, visual presentation (if available), and  
other play patterns of the game.

          The present invention has been described above in  
26           terms of preferred embodiments so that an understanding of  
the invention can be conveyed. There are, however, many  
configurations, forms, play-pattern environments, rules  
and logic, and circuit designs for master/server/host toys  
and play objects, not specifically described herein but to  
31           which the present invention is still applicable.

1           The foregoing illustrates preferred embodiments of  
the invention by way of example, not by way of limitation.  
For example, the RFID reader/interrogator and/or the RFID  
tag may come from other manufacturers, the play-patterns  
modified to accommodate different set of play-patterns or  
6 game rules, the play objects are housed in different forms  
(e. g. toy lamp, toy desk, toy chair, etc.), a different  
set of play objects is used, information contained in the  
RFID tags differs from those described herein, the game  
board is different, or the user presentation differs from  
11 the one described herein. A person skilled in this field  
will recognize that such variations may exist without  
departing from the principles of the invention. The  
present invention should therefore not be seen as limited  
to the particular embodiments described herein, but rather  
16 should be understood to have wide applicability with  
respect to master/server/host toys and play objects. All  
modifications, variations, or equivalent arrangements and  
implementations that are within the scope of the attached  
claims should therefore be considered within the scope of  
21 the invention.

26

31

WHAT IS CLAIMED IS:

1        1.    A toy or game apparatus comprising:

2                one or more play objects each having at least one  
3        remote nonself-powered RFID tag chip, said tag chip having  
4        readable/writeable data storage that contains digital data  
5        that includes at least object-identification information;  
6        and

7                at least one powered master unit each comprising a  
8        processor and an RFID reader/interrogator;

9                said master unit having at least one detection  
10       region for detecting said play objects;

11               said master unit being operable, when one said  
12       play object is in a localized detection region  
13       relative to said master unit so as to afford remote  
14       RF communication between said master unit and said  
15       tag chip of that play object, but without requiring  
16       physical contact between said master unit and said  
17       play object, to send power to energize that tag chip  
18       to enable said tag chip to transmit data at that time  
19       to said master unit; said tag chip being capable of  
20       receiving digital data from a master unit and storing  
21       such data in its writeable data storage, said data  
22       transmitted by said tag chip including its  
23       identification information;

24               wherein said play object is in said detection  
25       region because said master unit is moved relative to  
26       said play object, said play object is moved relative  
27       to said master unit, said master unit and said play  
28       object are both moved relative to each other, and/or

1        said master unit and said play object are already in  
2        stationary position relative to each other; and  
3        said master unit being operable to recognize  
4        said data transmitted from said tag chip to make a  
5        user presentation; said data transmitted and said  
6        presentation being related to play by a user with the  
7        toy or game play apparatus.

1        2.    The toy or game apparatus of claim 1:

2        wherein said master unit further being operable to  
3        simultaneously or apparently simultaneously recognize  
4        multiple transmitted data when more than one of said play  
5        objects are transmitting data to said master unit.

1        3.    The toy or game apparatus of claim 1:

2        wherein said master unit processor and said master  
3        unit RFID reader/interrogator are both contained in one  
4        toy housing.

1        4.    The toy or game apparatus of claim 1:

2        wherein said master unit processor and said master  
3        unit RFID reader/interrogator are contained in separate  
4        toy housings connected by a wired connection.

1        5.    The toy or game apparatus of claim 3:

2        wherein the toy housing is in three-dimensional form.

1       6.    The toy or game apparatus of claim 5:  
2            wherein the toy housing is in the form of a hand-held  
3   unit.

1       7.    The toy or game apparatus of claim 6:  
2            wherein the toy housing is in the form of a wand.

1       8.    The toy or game apparatus of claim 3:  
2            wherein the toy housing is in the form of a game  
3   board.

1       9.    The toy or game apparatus of claim 4:  
2            wherein at least one of the toy housings is in three-  
3   dimensional form.

1       10.   The toy or game apparatus of claim 1:  
2            wherein at least one of said one or more play objects  
3   is in three-dimensional form.

1       11.   The toy or game apparatus of claim 1:  
2            wherein at least one of said one or more play objects  
3   is a game-playing card.

1       12. The toy or game apparatus of claim 1:

2               wherein at least one of said one or more play objects  
3       is in two-dimensional form.

1       13. The toy or game apparatus of claim 1:

2               wherein said master unit further being operable to  
3       receive information provided by the user via an input  
4       device; and

5               wherein said tag chip further being capable of  
6       receiving said user-provided information from said master  
7       unit and storing said information in its writeable data  
8       storage.

1       14. The toy or game apparatus of claim 13:

2               wherein said user-provided information includes  
3       ownership information related to said play object.

1       15. The toy or game apparatus of claim 13:

2               wherein said user-provided information includes  
3       information related to authorized transfer, exchange,  
4       processing, and/or trade of said object and play substance  
5       data of said object.

1       16. The toy or game apparatus of claim 14:

2               wherein said ownership information is provided via a  
3       master control card.



1       17. The toy or game apparatus of claim 15:

2               wherein said information is provided via a master  
3 control card.

1       18. The toy or game apparatus of claim 1:

2               wherein said data storage contains variable play  
3 substance data related to said play by the user with the  
4 toy or game play apparatus.

1       19. The toy or game apparatus of claim 1:

2               wherein said digital data being received from said  
3 master unit and stored in said data storage are variable  
4 play substance data related to said play by the user with  
5 the toy or game play apparatus.

1       20. The toy or game apparatus of claim 1:

2               wherein said RFID reader/interrogator and/or said  
3 RFID tag chip is coupled to at least two antennas.

1       21. The toy or game apparatus of claim 20:

2               wherein said master unit being further operable to  
3 selectively enable and disable at least one of said  
4 antennas.

1       22. The toy or game apparatus of claim 20:  
2               wherein said at least two antennas are orthogonally  
3 arranged.

1       23. The toy or game apparatus of claim 20:  
2               wherein the RFID reader/interrogator and/or the RFID  
3 tag chip is coupled to at least three antennas.

1       24. The toy or game apparatus of claim 23:  
2               wherein said at least three antennas are setup in  
3 such a way so as to maximize the RF coupling efficiency of  
4 said tag IC with said RFID reader/interrogator.

1       25. The toy or game apparatus of claim 1:  
2               wherein said RFID reader/interrogator and/or said  
3 RFID tag chip is coupled to at least one antenna.

1       26. The toy or game apparatus of claim 25:  
2               wherein said at least one antenna is an inductive  
3 coupling element.

1       27. The toy or game apparatus of claim 25:  
2               wherein said at least one antenna is a capacitive  
3 coupling element.

1       28. The toy or game apparatus of claim 25:

2               wherein said at least one antenna coupled to said  
3       RFID reader/interrogator reader is coupled to a fine-  
4       tuning capacitor.

1       29. The toy or game apparatus of claim 1:

2               wherein said RFID reader/interrogator is activated on  
3       an energy-efficient time-multiplexed basis.

1       30. The toy or game apparatus of claim 1 further  
2       comprising:

3               at least one user-presentation device under the  
4       control of said processor.

1       31. The toy or game apparatus of claim 30:

2               wherein said user-presentation device is a visual  
3       display.

1       32. The toy or game apparatus of claim 30:

2               wherein said user-presentation device is an audio  
3       device.

1       33. The toy or game apparatus of claim 1:

2               wherein said master unit includes circuitry to  
3       communicate with an external device and/or communicate  
4       with an external communication network.

1        34. A toy or game apparatus for use with one or more  
2        play objects each having at least one remote nonself-  
3        powered RFID tag chip, said tag chip having data storage  
4        that contains digital data that includes at least object-  
5        identification information; said toy or game apparatus  
6        comprising:

7                a hand-held game/computing device, including a  
8        processor;

9                an accessory device, including an RFID  
10       reader/interrogator; and

11               a play program, comprising one or more program  
12       components, controlling the processor and the RFID  
13       reader/interrogator.

1        35. The toy or game apparatus of claim 34:

2                wherein the accessory device is coupled to the hand-  
3       held game/computing device via a plug-in interface  
4       associated with the hand-held game/computing device.

1        36. The toy or game apparatus of claim 34:

2                wherein the play program is contained in a game  
3       cartridge/pack.

1        37. The toy or game apparatus of claim 36:

2                wherein the game cartridge/pack communicates with the  
3       hand-held game/computing device via a pass-through  
4       interface coupled to or associated with the accessory  
5       device.

1       38. The toy or game apparatus of claim 34:

2               wherein the play program controls how data are  
3       processed.

1       39. The toy or game apparatus of claim 34:

2               wherein the RFID reader/interrogator being operable  
3       to read, write, and/or rewrite/update data contained in  
4       the data storage of the RFID tag chip of said one or more  
5       play objects, when one said object is in position in a  
6       localized detection region relative to said accessory  
7       device such as will afford remote RF communication between  
8       said RFID reader/interrogator and said tag chip, but  
9       without requiring physical contact between said accessory  
10      device and said play object, to send power to energize  
11      said tag chip to transmit data at that time.

1       40. The toy or game apparatus of claim 34:

2               wherein the play program controls and processes  
3       variable play substance data related to the play pattern  
4       in the play program and accordingly instructs the RFID  
5       reader/interrogator to read, write, and/or rewrite/update  
6       digital data in the data storage of said tag chip of said  
7       object.

1       41. The toy or game apparatus of claim 34:

2               wherein the game/computing device includes a user-  
3       presentation device.

1       42. The toy or game apparatus of claim 41:

2               wherein the user-presentation device is an audio  
3 device.

1       43. The toy or game apparatus of claim 41:

2               wherein the user-presentation device is a visual  
3 display.

1       44. The toy or game apparatus of claim 34:

2               wherein the hand-held game/computing device  
3 interfaces with another game device.

1       45. The toy or game apparatus of claim 34:

2               wherein the hand-held game/computing device  
3 interfaces or connects with the Internet.

1       46. The toy or game apparatus of claim 34:

2               wherein the hand-held game/computing device is a  
3 GAMEBOY unit.

1        47. An accessory device for use with a hand-held  
2        game/computing device and a game cartridge/pack that  
3        contains a play program comprising one or more program  
4        components; said hand-held game/computing device having a  
5        processor and an interface/connector for removably  
6        receiving said accessory device; said play program  
7        controlling said hand-held game/computing device and said  
8        accessory device; said accessory device for use with at  
9        least one play object each having at least one remote  
10       digital nonself-powered radio frequency identification  
11       (RFID) tag chip with each RFID tag chip having a data  
12       storage; said accessory device comprising:  
13                at least one RFID reader/interrogator chip;  
14                a receiving connector/interface for removably  
15       receiving the game cartridge/pack; and  
16                one or more control circuits interfacing the game  
17       cartridge/pack and the hand-held game/computing device.

1        48. The device of claim 47:  
2                wherein said RFID reader/interrogator chip being  
3       operable to receive instructions from said hand-held  
4       game/computing device processor under the control of said  
5       play program; and said instructions include instructions  
6       controlling said RFID reader/interrogator chip to read,  
7       write, and/or rewrite/update digital data in said data  
8       storage of said RFID tag chip.

1        49. The device of claim 47:  
2                wherein the receiving connector/interface is a pass-  
3        through interface between the game cartridge/pack and the  
4        hand-held game computing device.



1       50. A toy or game apparatus for use with at least one  
2       object each having at least one remote nonself-powered  
3       RFID tag chip, said tag chip having writeable digital data  
4       storage that contains digital data that includes at least  
5       object-identification information; said toy or game  
6       apparatus comprising:

7             a user-presentation device; and

8             at least one powered master unit including a  
9       processor and an RFID reader/interrogator;

10            said each master unit having at least one  
11       detection region for detecting the objects;

12            said each master unit being operable, when one  
13       said object is in position in a localized detection  
14       region relative to said master unit so as to afford  
15       remote RF communication between said master unit and  
16       the RFID tag chip of that object, but without  
17       requiring the physical contact between said master  
18       unit and that play object, to send power to energize  
19       that tag chip to enable said tag chip to transmit  
20       data at that time to said master unit, said tag chip  
21       being capable of receiving digital data from a master  
22       unit and storing such data in its writeable data  
23       storage when said RF communication exists between  
24       said master unit and said tag chip; wherein said  
25       digital data received from said master unit relates  
26       to variable play substance data related to play by a  
27       user with the toy or game apparatus;

28            said each master unit being operable to  
29       recognize said data transmitted from said tag chip  
30       and to make a user presentation using said user-  
31       presentation device; said data transmitted and said

1 presentation being related to play by a user with the  
2 toy or game play apparatus.

1 51. The toy or game apparatus of claim 50, further  
2 comprising:  
3 a toy housing containing said user-presentation  
4 device and said master unit.

1 52. The toy or game apparatus of claim 51:  
2 wherein the toy housing is a cellular phone-type  
3 enclosure.

1 53. The toy or game apparatus of claim 51:  
2 wherein the toy housing is a kiosk.

1 54. The toy or game apparatus of claim 51:  
2 wherein the toy housing is a videophone.

1 55. The toy or game apparatus of claim 51:  
2 wherein the toy housing is a figurine.

1 56. The toy or game apparatus of claim 51:  
2 wherein the toy housing is a doll.

1 57. The toy or game apparatus of claim 51:  
2 wherein the toy housing is a game board.

1        58. The toy or game apparatus of claim 51:

2                wherein the toy housing comprises one or more housing  
3        components.

1        59. A method of game playing by a user using an RFID  
2        reader/interrogator and at least one play object each  
3        having at least one remote digital nonself-powered RFID  
4        tag chip, said tag chip having writeable data storage that  
5        contains digital data that includes at least object-  
6        identification information; said method comprising the  
7        steps of:

8                providing at least one said play object;

9                providing at least one master unit;

10                using said at least one master unit including an RFID  
11        reader/interrogator to read data from the data storage of  
12        said tag chip of said object; and wherein said using step  
13        also includes recognizing said object, based on the  
14        information read from data storage, when said object is in  
15        a detection position relative to said master unit; and

16                providing a game/play program controlling the RFID  
17        reader/interrogator and controlling how data read from the  
18        object are going to be processed within the game, wherein  
19        said game/play program instructs said RFID  
20        reader/interrogator to read, write, rewrite/update  
21        variable play substance data in said data storage of said  
22        object, and wherein the variable play substance data are  
23        related to the game play by the user with said object.

1       60. The method of claim 59:

2               wherein the using step further includes reading the  
3 data from the data storage while said play object is in  
4 motion and is in the detection area of the master unit,  
5 and while the master unit is in a stationary position.

1       61. The method of claim 59:

2               wherein the using step further includes reading the  
3 data from the data storage while said play object is in  
4 motion and is in the detection area of the master unit,  
5 and while the master unit is also in motion.

1       62. The method of claim 59:

2               wherein the using step further includes reading the  
3 data from the data storage while said play object is  
4 stationary and is in the detection area of the master  
5 unit, and while the master unit is also stationary.

1       63. The method of claim 59:

2               wherein the using step further includes reading the  
3 data from the data storage while said play object is  
4 stationary and is in the detection area of the master  
5 unit, and while the master unit is in motion.

1       64. The method of claim 59, further comprising the step  
2       of:

3             using the master unit to write into said data storage  
4       variable play substance data related to the play pattern  
5       in said game/play program.

1       65. The method of claim 59, further comprising the step  
2       of:

3             providing a user presentation based on said variable  
4       play substance data.

1       66. The method of claim 59, further comprising the step  
2       of:

3             receiving user-provided information via an input  
4       device.

1       67. The method of claim 66:

2             wherein the master unit using step further includes  
3       transmitting said user-provided information to the data  
4       storage of said play object.

1       68. The method of claim 66:

2             wherein the user-provided information includes,  
3       ownership and/or information related to authorized  
4       transfer, exchange, processing, and/or trade of said  
5       object and play substance data of said object.

1        69. A toy or game apparatus for use with at least one  
2        play object each having at least one remote nonself-  
3        powered RFID tag chip, said tag chip having a writeable  
4        digital data storage that contains digital data that  
5        includes at least object-identification information; said  
6        toy or game apparatus comprising:

7                an input device; and

8                at least one powered master unit including processor  
9        and an RFID reader/interrogator; said master unit having  
10       one or more detection area for detecting the at least one  
11       toy object;

12               said master unit being operable, when one said play  
13       object is in position in a localized detection area  
14       relative to said master unit so as to afford remote RF  
15       communication between said master unit and the RFID tag  
16       chip of that object, to send power to energize that tag  
17       chip to enable said tag chip to transmit data at that time  
18       to said master unit, said tag chip being capable of  
19       receiving digital data from a master unit and storing such  
20       data in its writeable data storage when said RF  
21       communication exists between said master unit and the RFID  
22       tag chip; wherein said digital data received from a master  
23       unit relates to variable play substance data related to  
24       play by a user with the toy or game apparatus; and

25               said master unit being operable to receive data  
26       provided by a user, including ownership data, via said  
27       input device.

1       70.       A toy or game play apparatus comprising:  
2               at least one hand-held movable master unit each  
3       having at least one RFID reader/interrogator for reading  
4       one or more play objects;  
5               said one or more play objects each having at least  
6       one remote nonself-powered RFID tag IC with data storage  
7       that includes at least object-identity information; and  
8               a processor controlling said RFID reader/interrogator  
9       to read, write, and/or rewrite/update said data storage;  
10       said processor being operable under the control of a game  
11       or play program;  
12               said movable master unit being operable when one said  
13       play object is in a detection region of said master unit  
14       such as will afford RF communication between said master  
15       unit RFID reader/interrogator and the RFID tag IC of that  
16       play object, to send power to energize that tag IC to  
17       cause that tag IC to transmit data back to said master  
18       unit; a master unit also being operable to recognize that  
19       transmitted data.

1       71.       The toy or game play apparatus of claim 70:  
2               wherein said hand-held movable master unit is in  
3       three-dimensional form.

1       72.       The toy or game play apparatus of claim 71:  
2               wherein said hand-held movable master unit looks like  
3       a wand, scanner, rod, or stick.

1       73. The toy or game play apparatus of claim 70:  
2           wherein one of said one or more play objects has at  
3       least one variable play substance data related to said  
4       game or play program.

1       74. The toy or game play apparatus of claim 73:  
2           wherein said variable play substance data is updated  
3       and/or written into said data storage during operation of  
4       said game or play program.

1       75. The toy or game play apparatus of claim 70:  
2           wherein at least one of said one or more play objects  
3       is in two-dimensional form.

1       76. The toy or game play apparatus of claim 70:  
2           wherein said two-dimensional form is in the form of a  
3       play card.

1       77. The toy or game play apparatus of claim 70:  
2           wherein at least one of said one or more play objects  
3       is in three-dimensional form.



1        78. An accessory device for use with a game/computing  
2        device or console and a play program comprising one or  
3        more program components; said game/computing device having  
4        a processor and an interface/connector for receiving said  
5        accessory device; said play program controlling said  
6        game/computing device and said accessory device; said  
7        accessory device for use with at least one play object  
8        each having at least one remote digital nonself-powered  
9        radio frequency identification (RFID) tag chip; said RFID  
10       tag chip having a data storage; said accessory device  
11       comprising:

12       at least one RFID reader/interrogator chip; and  
13       a connector/interface connecting said at least one  
14       RFID reader/interrogator chip to said game/computing  
15       device;

16       wherein said at least one RFID reader/interrogator  
17       chip being operable to receive instructions from said  
18       processor under the control of said play program.

1       79. The device of claim 78:

2       wherein said instructions from said processor include  
3       instructions controlling said RFID reader/interrogator  
4       chip to read, write, and/or rewrite/update digital data in  
5       said data storage of said RFID tag chip.

1       80. The device of claim 78:

2       wherein said play program comes from a readable  
3       medium or media read and loaded by said game/computing  
4       device to control said processor.

1       81. The device of claim 78:

2               wherein said connector/interface is plugged into an  
3       interface provided by said game/computing device.

1       82. A toy or game apparatus for use with one or more  
2       play objects each having at least one remote nonself-  
3       powered RFID tag chip, each of said tag chip having data  
4       storage that contains digital data that includes at least  
5       object-identification information; said toy or game  
6       apparatus comprising:

7               a game/computing device, including a processor and a  
8       built-in or integrated RFID reader/interrogator; and

9               a play program, comprising one or more program  
10       components, controlling the processor and the RFID  
11       reader/interrogator.

1       83. The toy or game apparatus of claim 82:

2               wherein the play program controls how data are  
3       processed.

1       84. The toy or game apparatus of claim 82:

2               wherein the RFID reader/interrogator being operable  
3       to read, write, and/or rewrite/update data contained in  
4       the data storage of the RFID tag chip of said objects,  
5       when one said object is in a localized detection region  
6       relative to said game/computing device such as will afford  
7       remote RF communication between said RFID  
8       reader/interrogator and said tag chip, but without  
9       requiring physical contact between said game/computing  
10      device and said play object, to send power to energize  
11      said tag chip to transmit data at that time.

1       85. The toy or game apparatus of claim 82:

2               wherein the play program controls and processes  
3       variable play substance values related to the play pattern  
4       in the play program and accordingly instructs the RFID  
5       reader/interrogator to read, write, and/or rewrite/update  
6       digital data in the data storage of said tag chip of said  
7       object.

1       86. The toy or game apparatus of claim 82:

2               wherein the game/computing device interfaces with  
3       another game device.

1       87. The toy or game apparatus of claim 82:

2               wherein the game/computing device interfaces or  
3       connects with the Internet.

1       88. The toy or game apparatus of claim 82:  
2           wherein the game/computing device is a video game  
3       console and/or personal computing game unit.

1       89. The toy or game apparatus of claim 88:  
2           wherein the game/computing device is an XBOX unit.

1       90. The toy or game apparatus of claim 88:  
2           wherein the game/computing device is a PLAYSTATION  
3       unit.

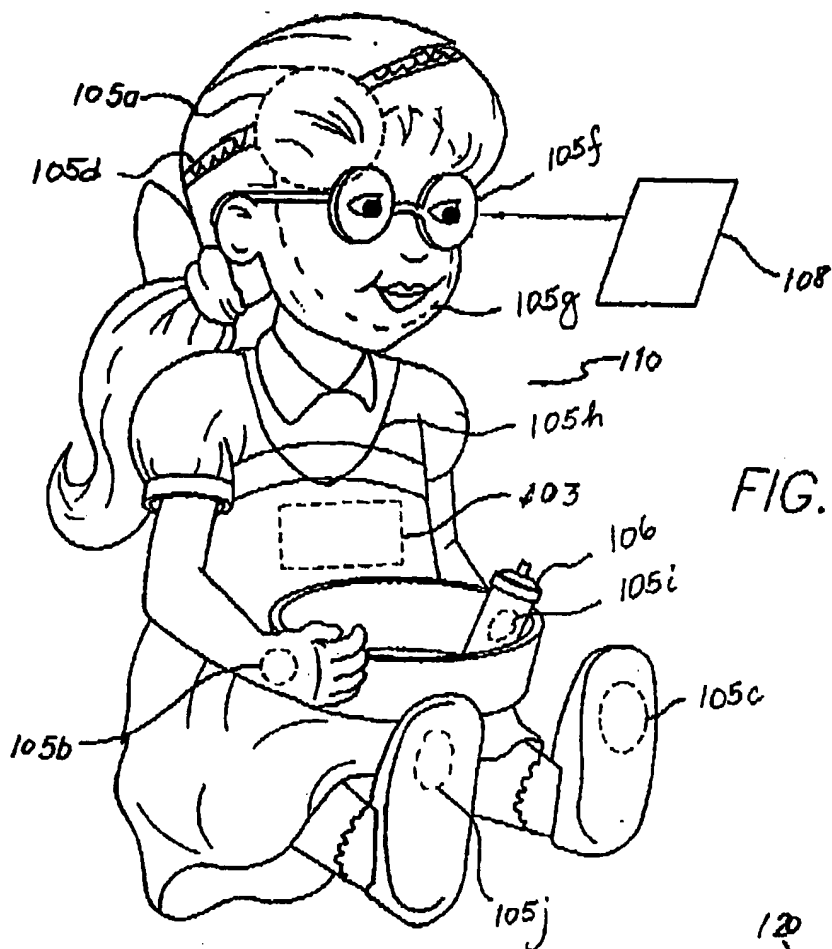
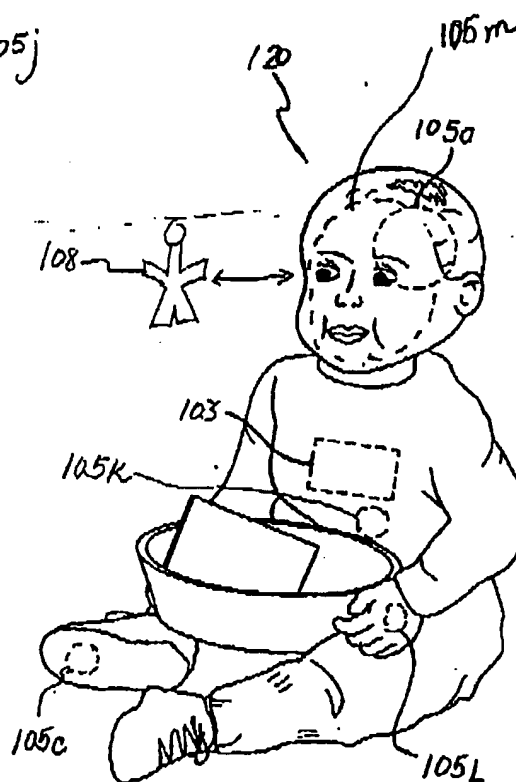
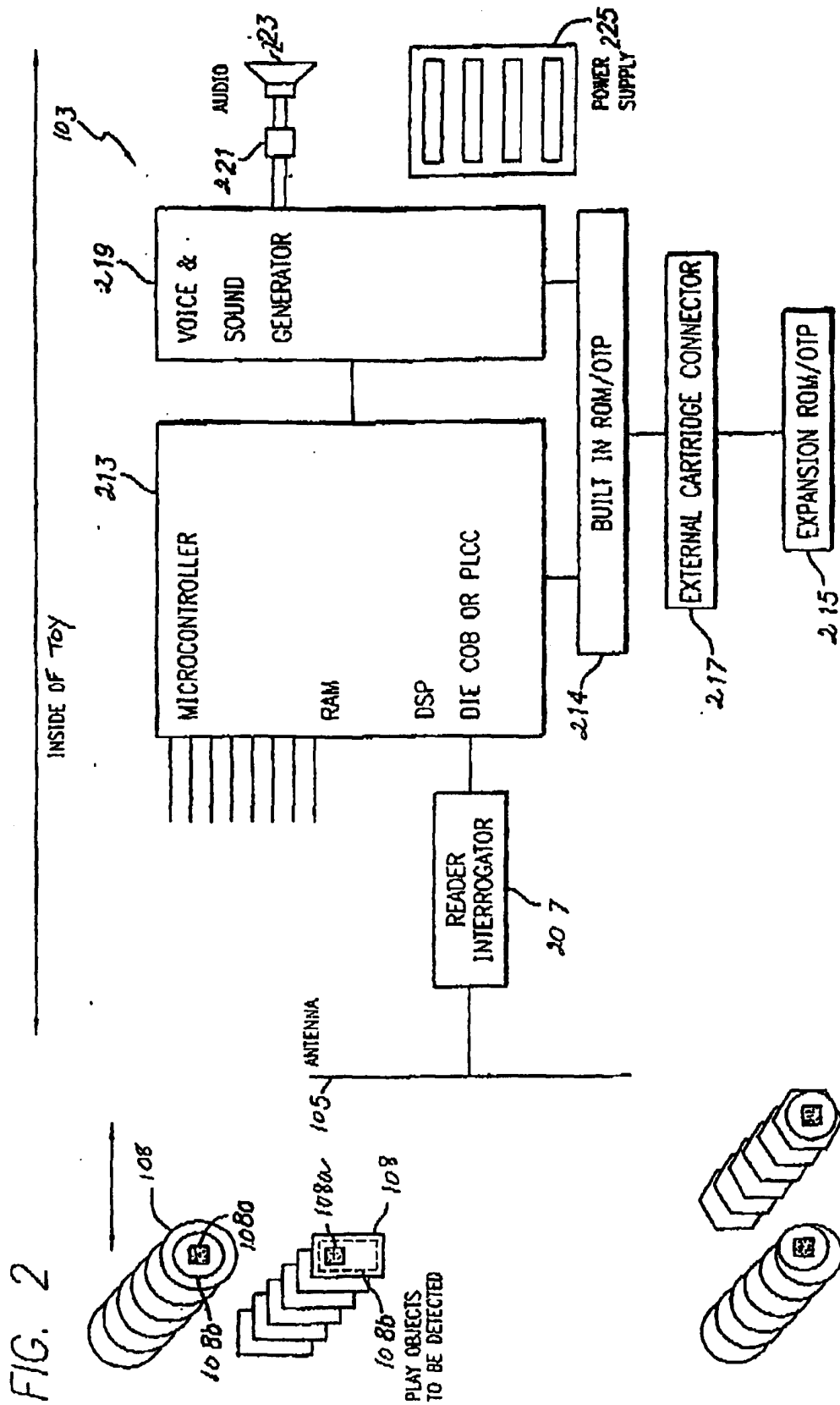
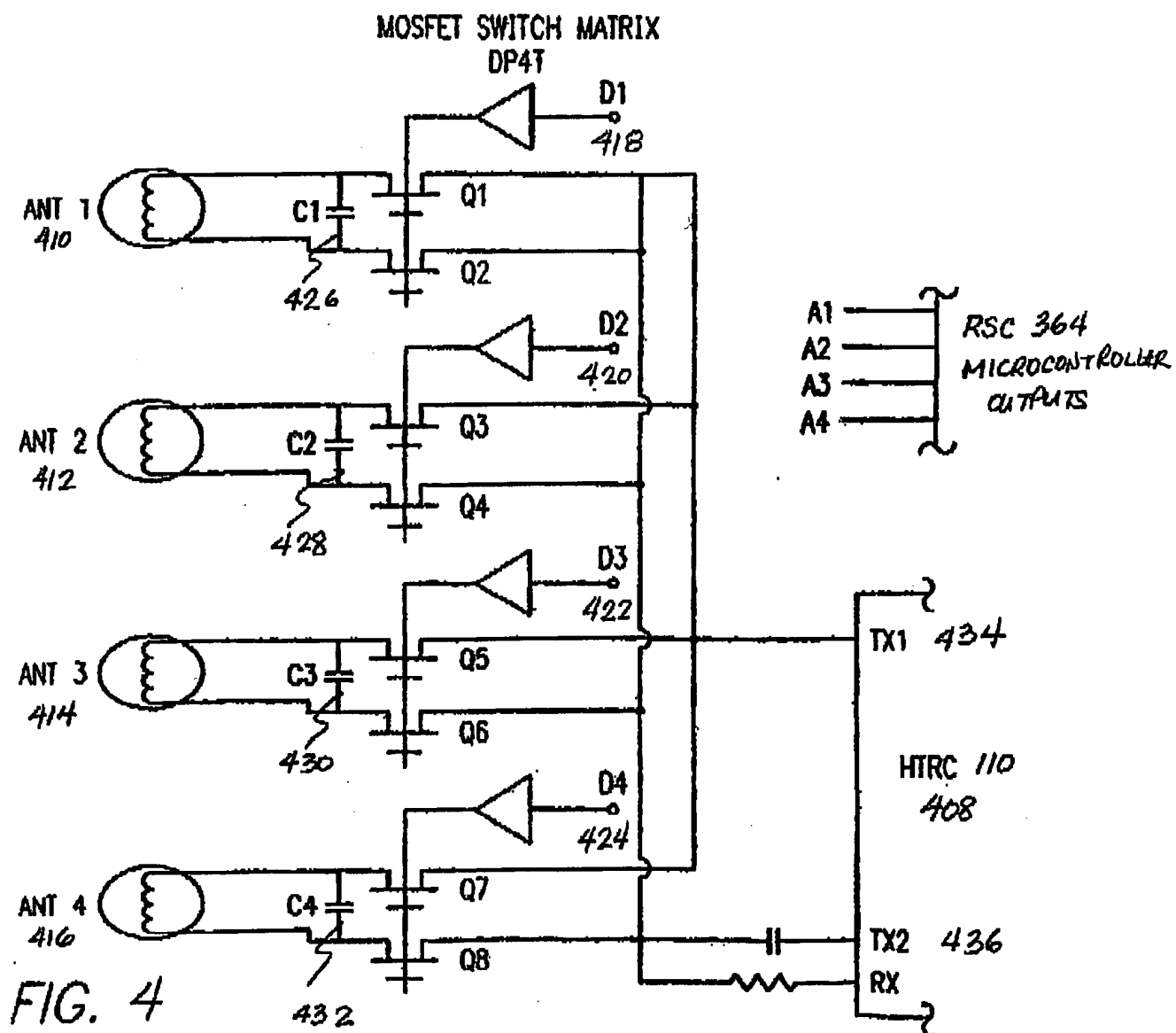
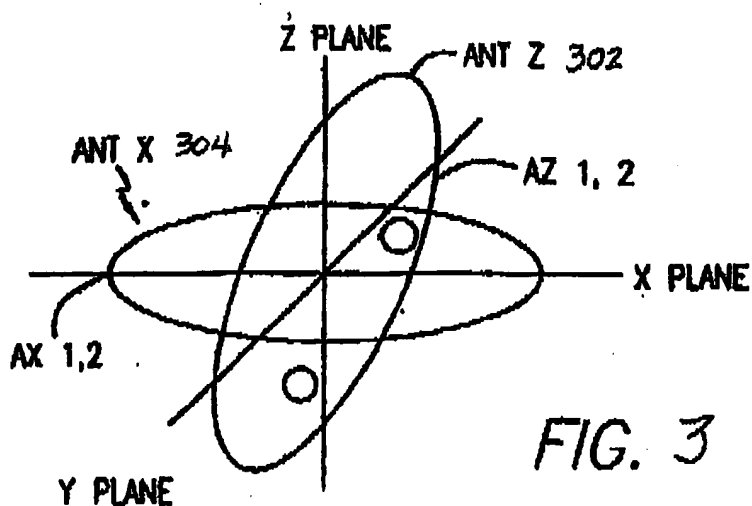


FIG. 1B







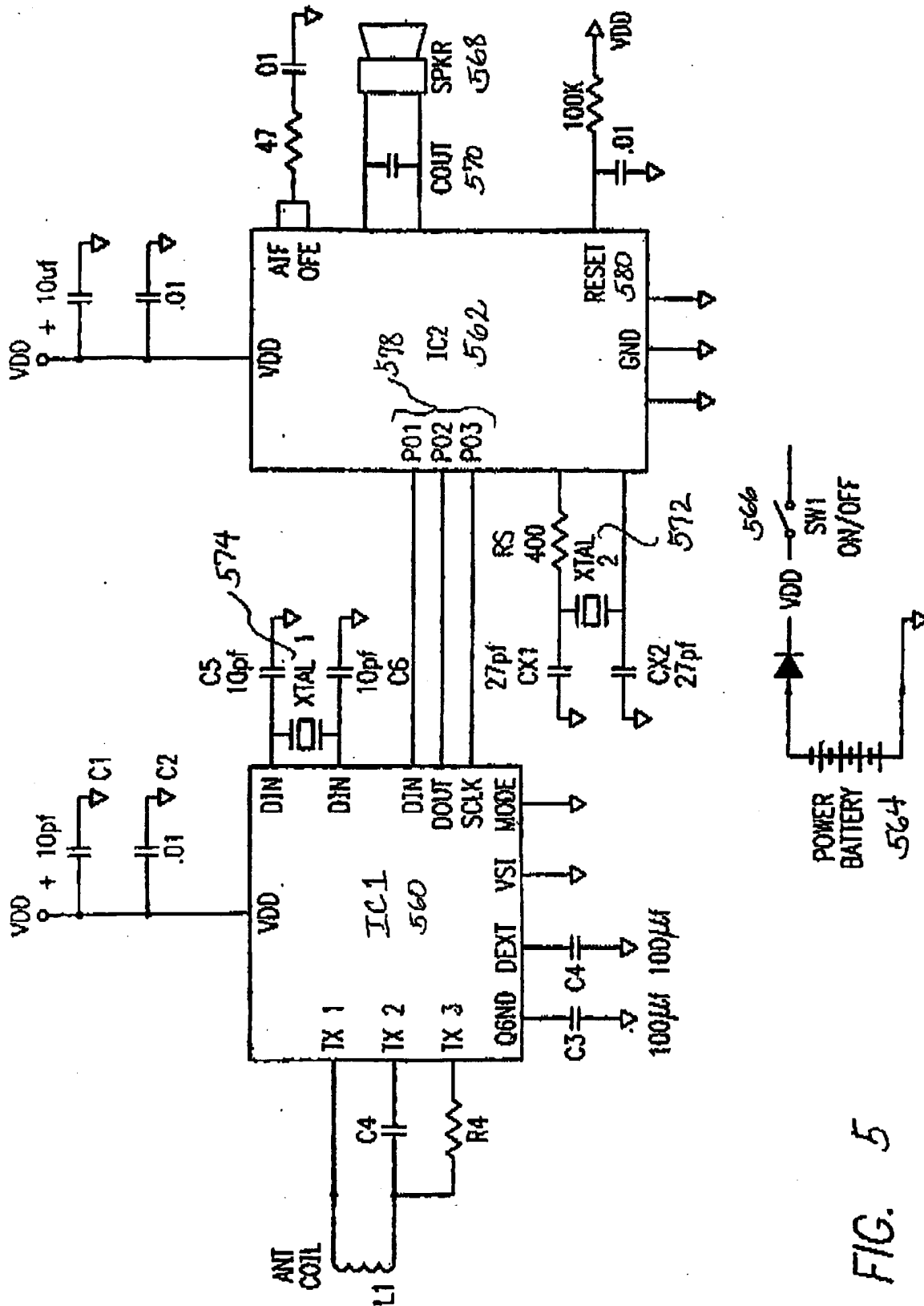
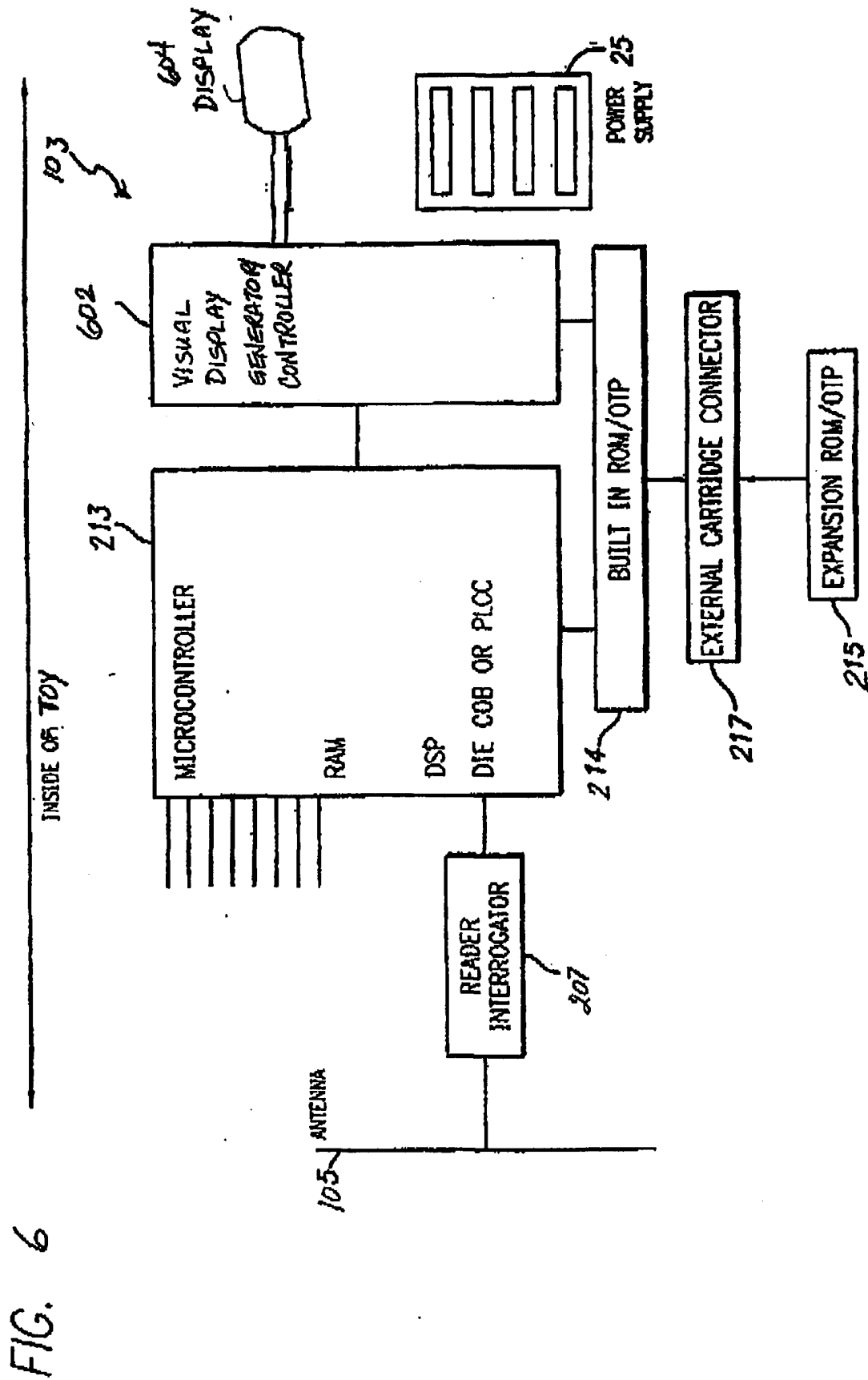
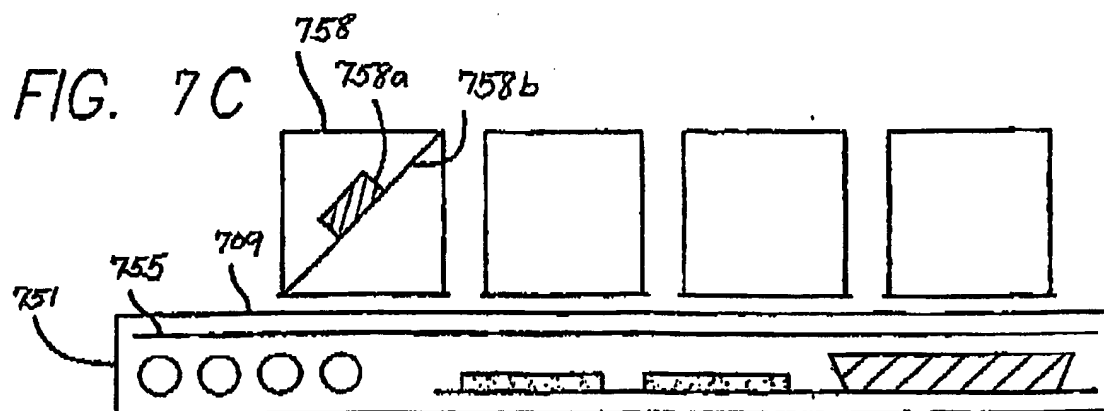
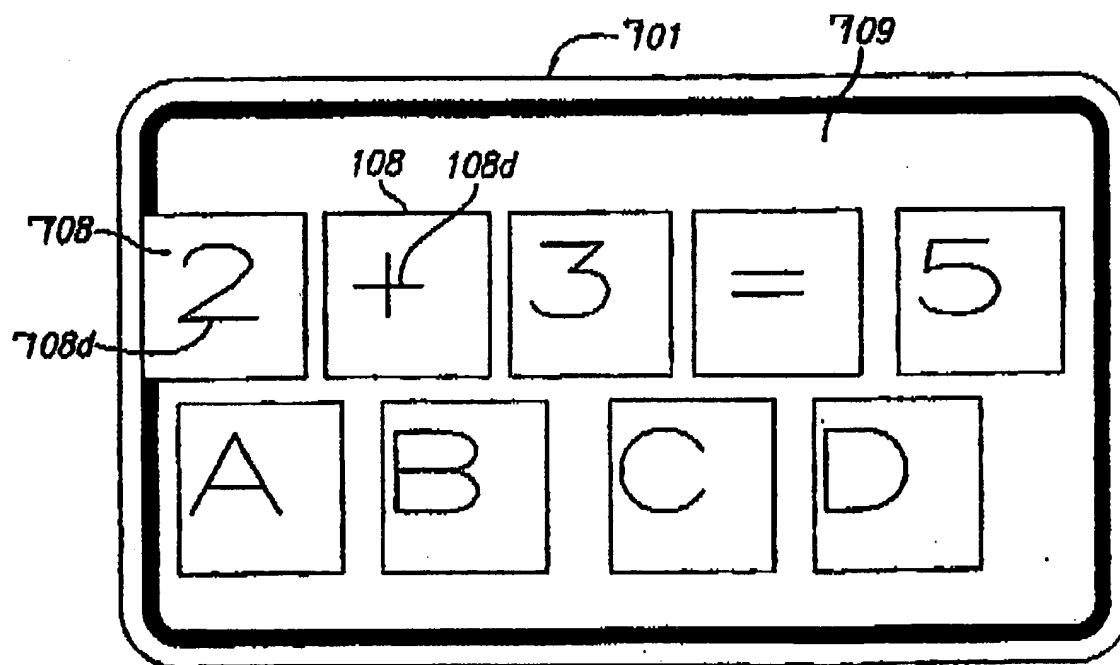
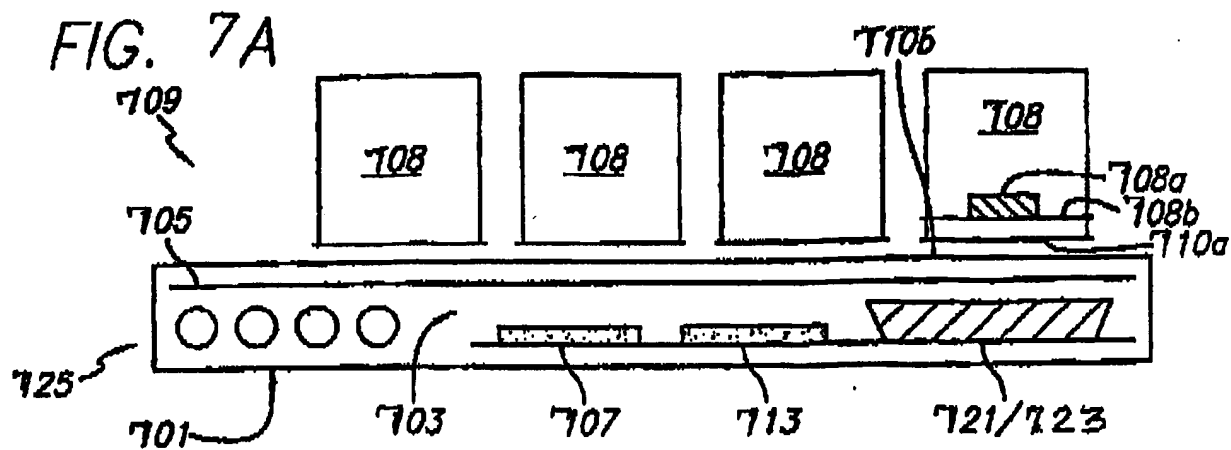
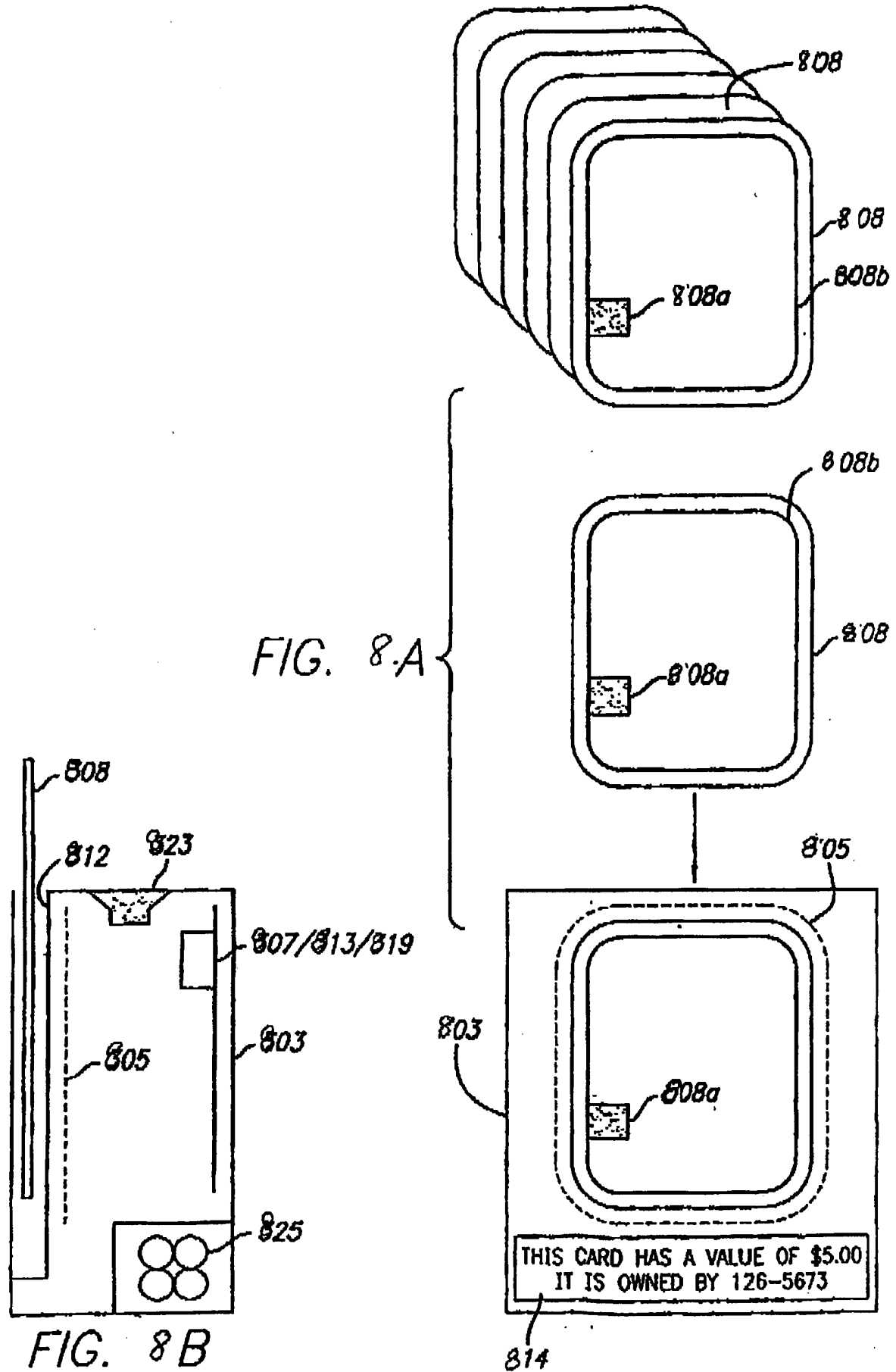


FIG. 5









8/19

FIG. 9A

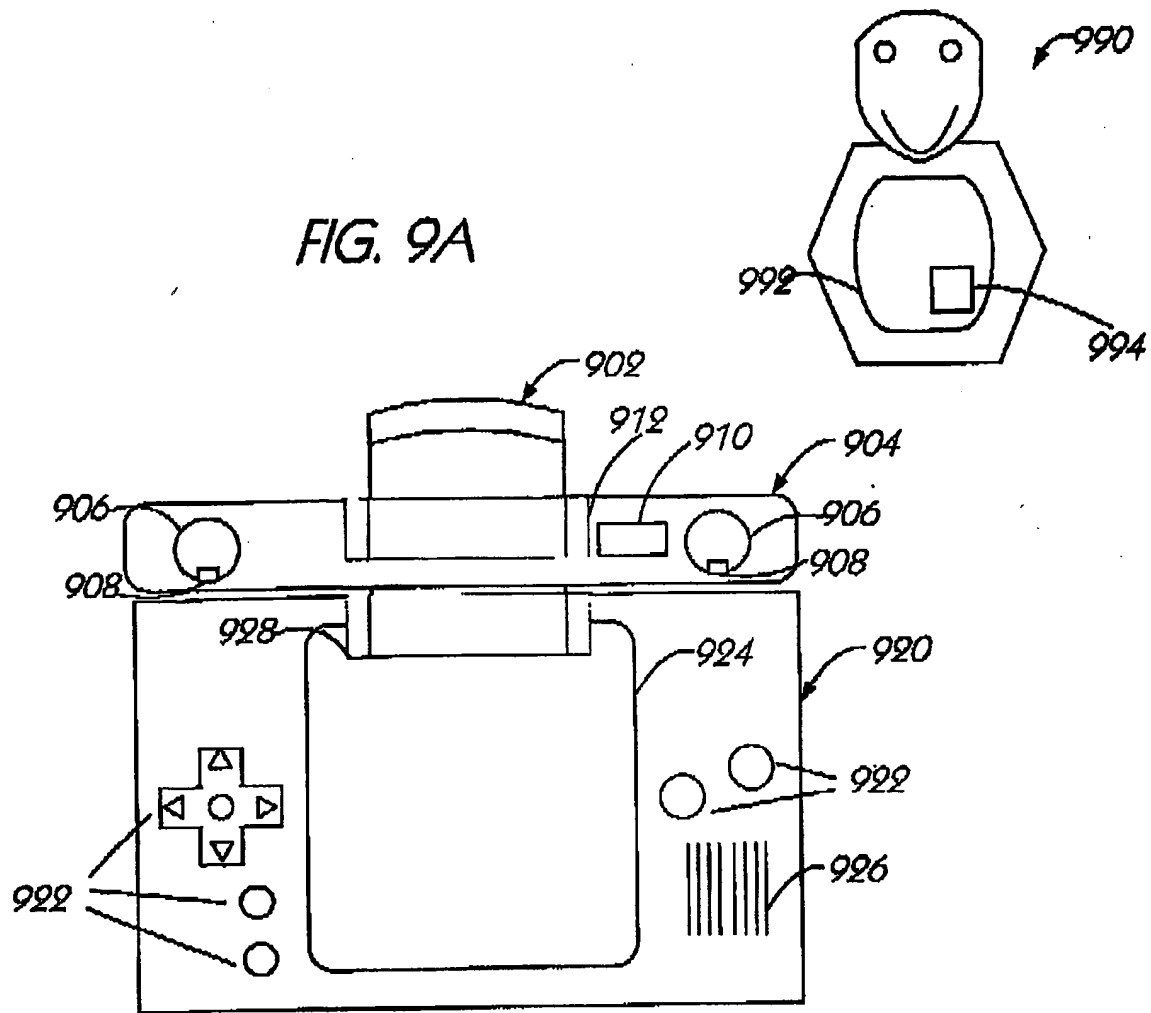


FIG. 9B

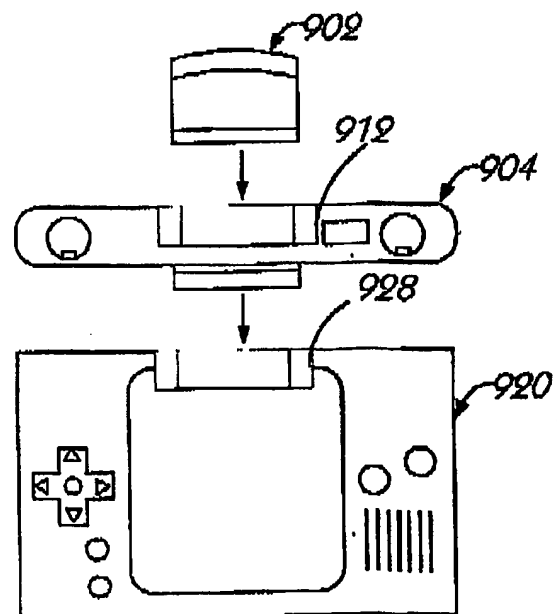


FIG. 9C

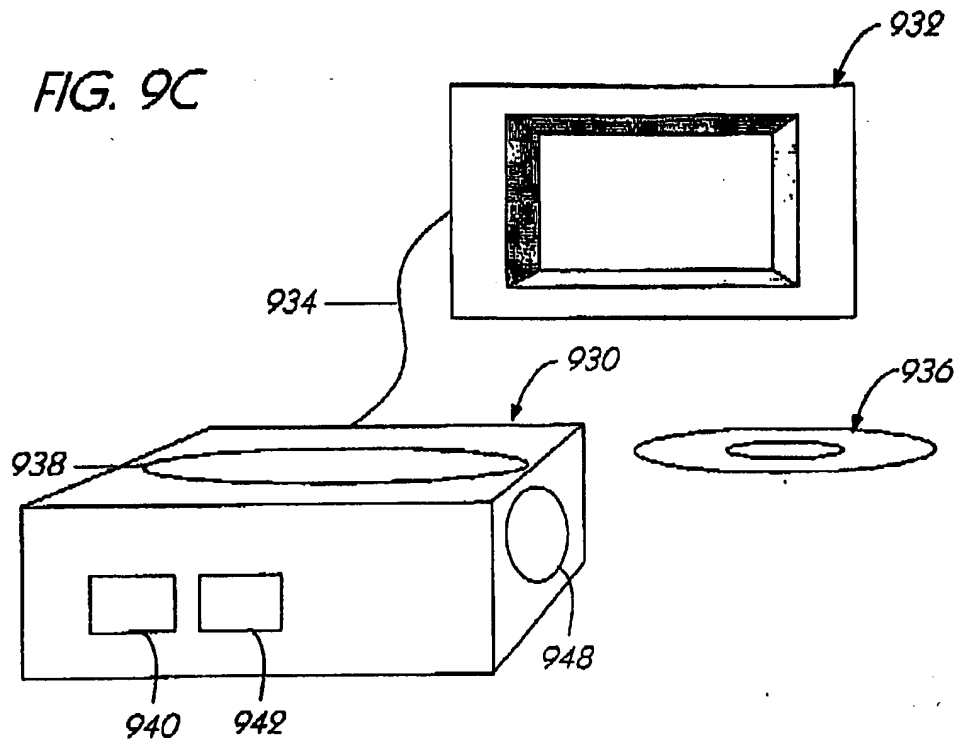


FIG. 9D

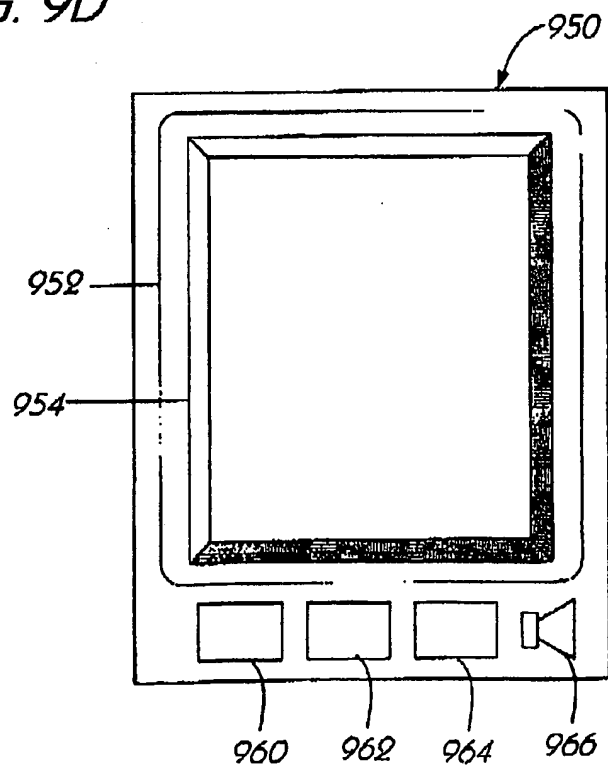


FIG. 10A

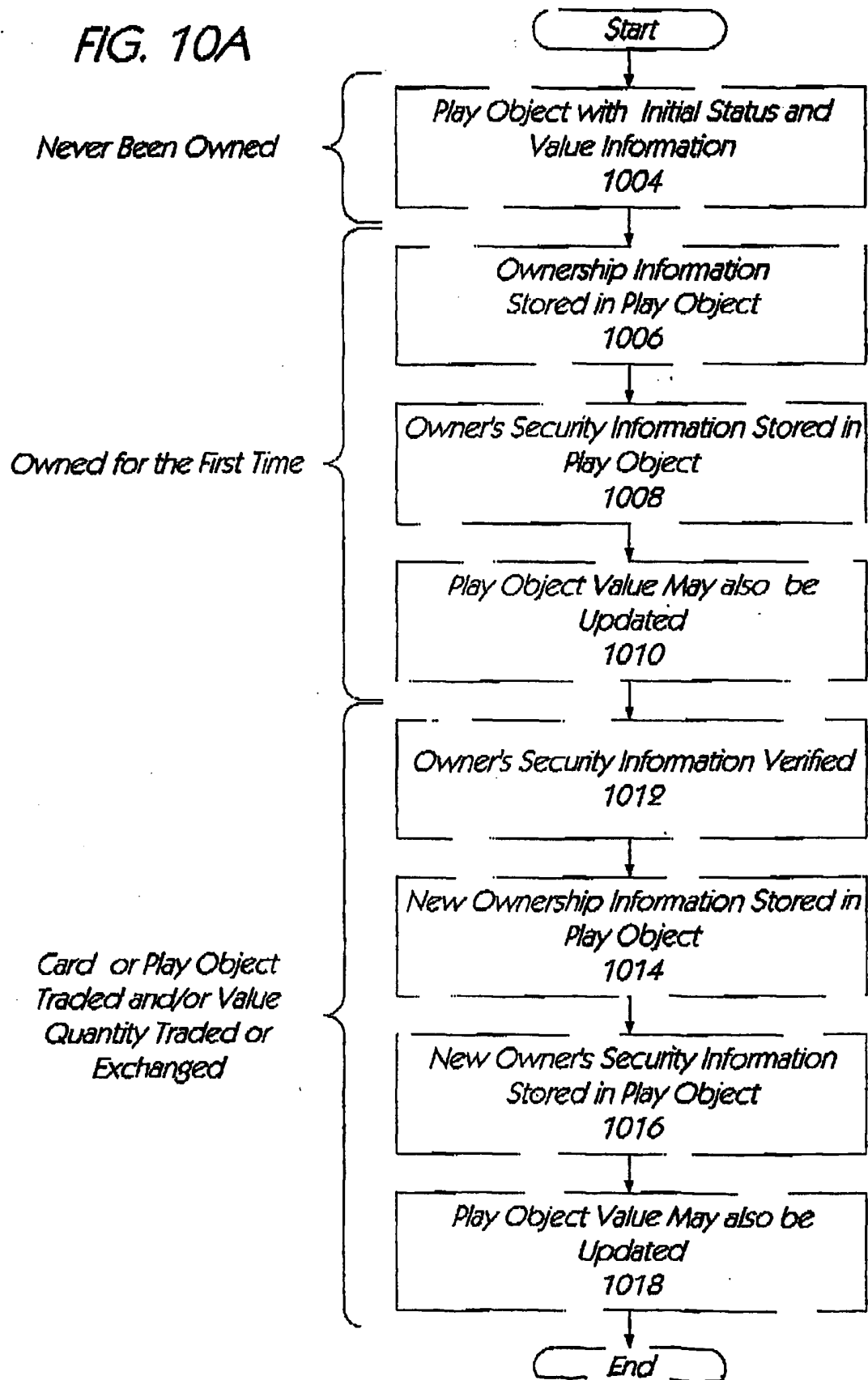


FIG. 10B

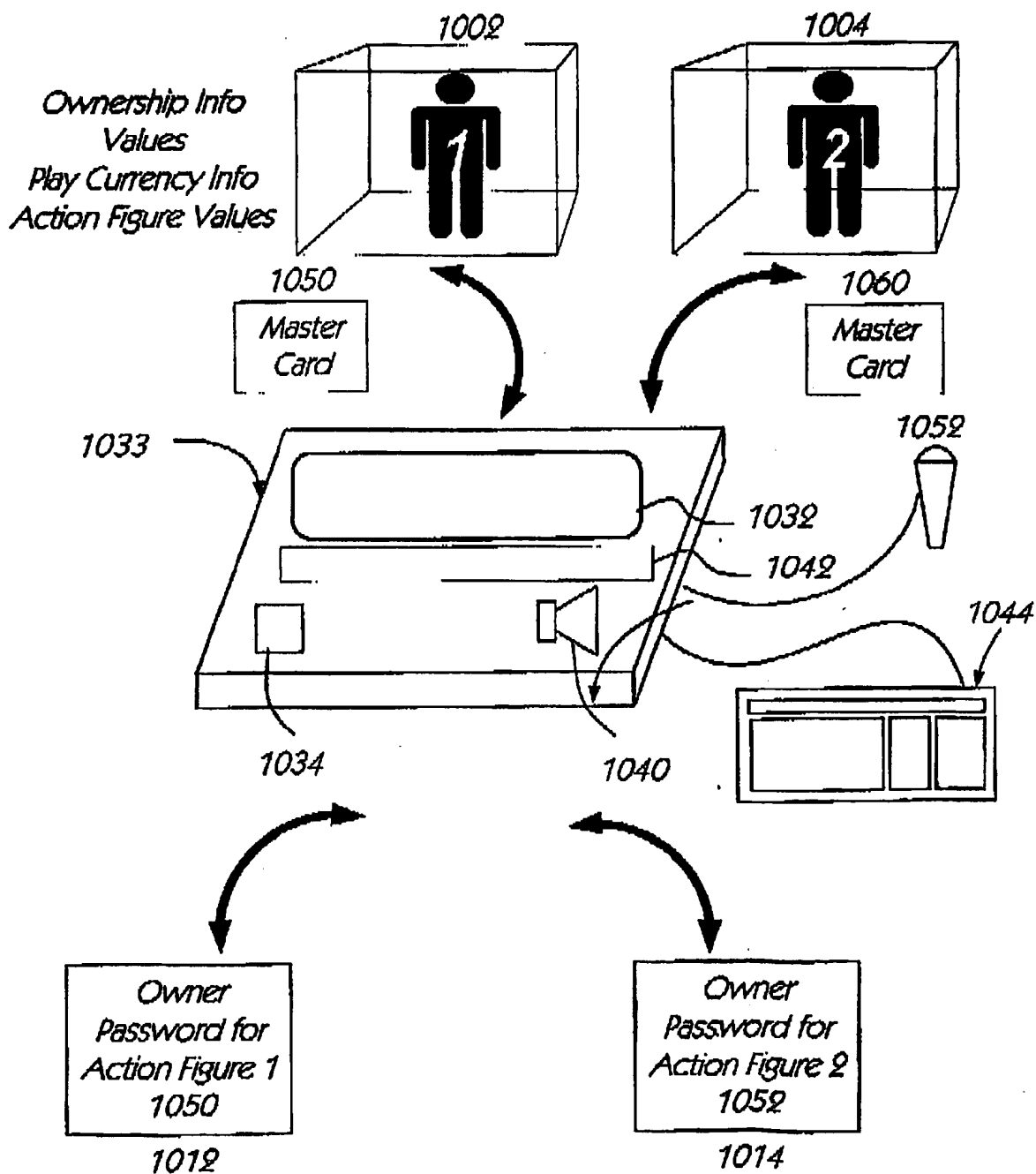


FIG. 11

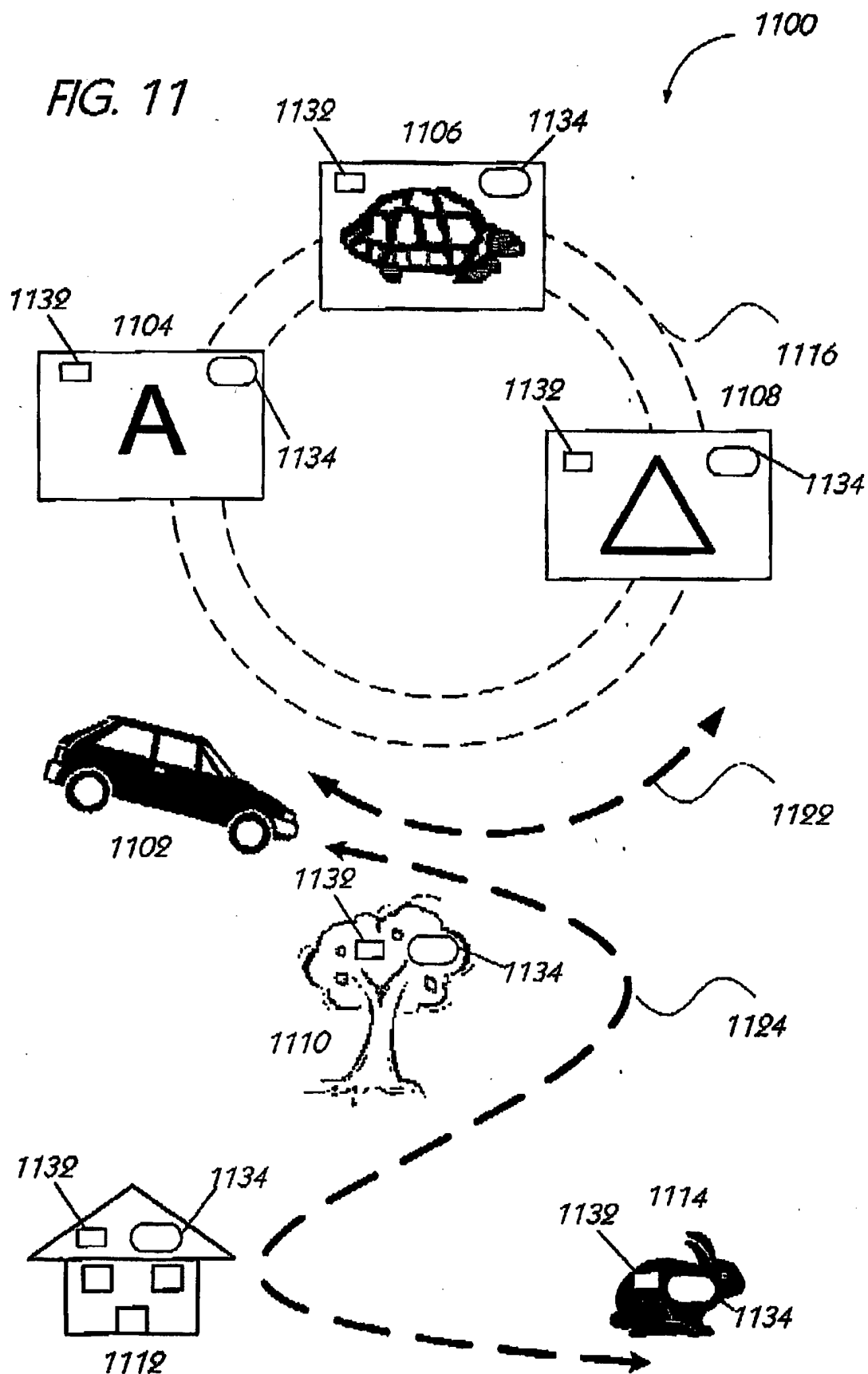




FIG. 12A

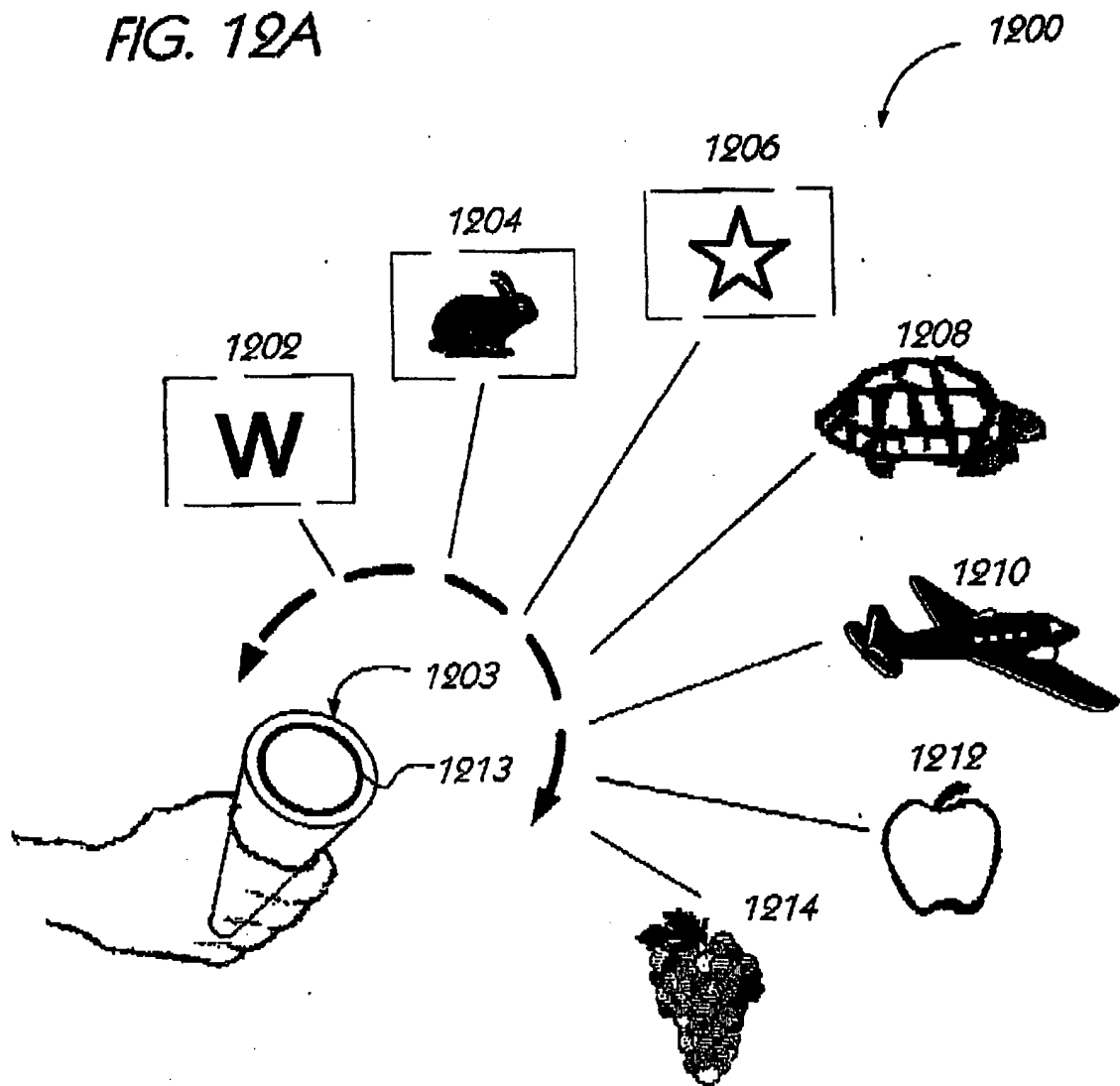


FIG. 12B

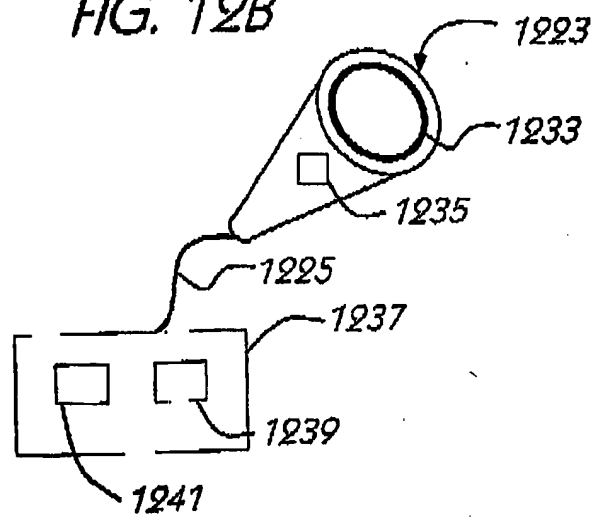


FIG. 12C

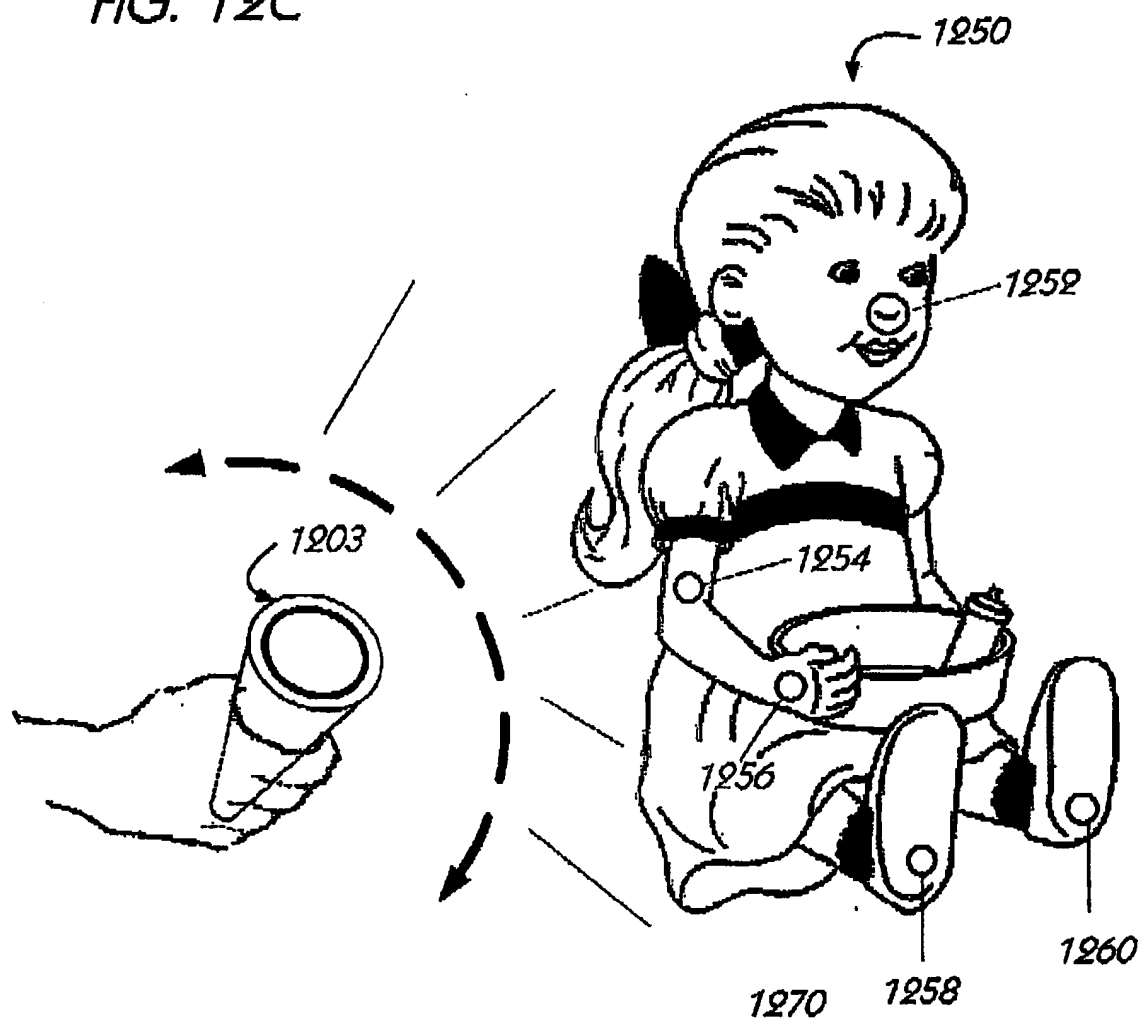


FIG. 13

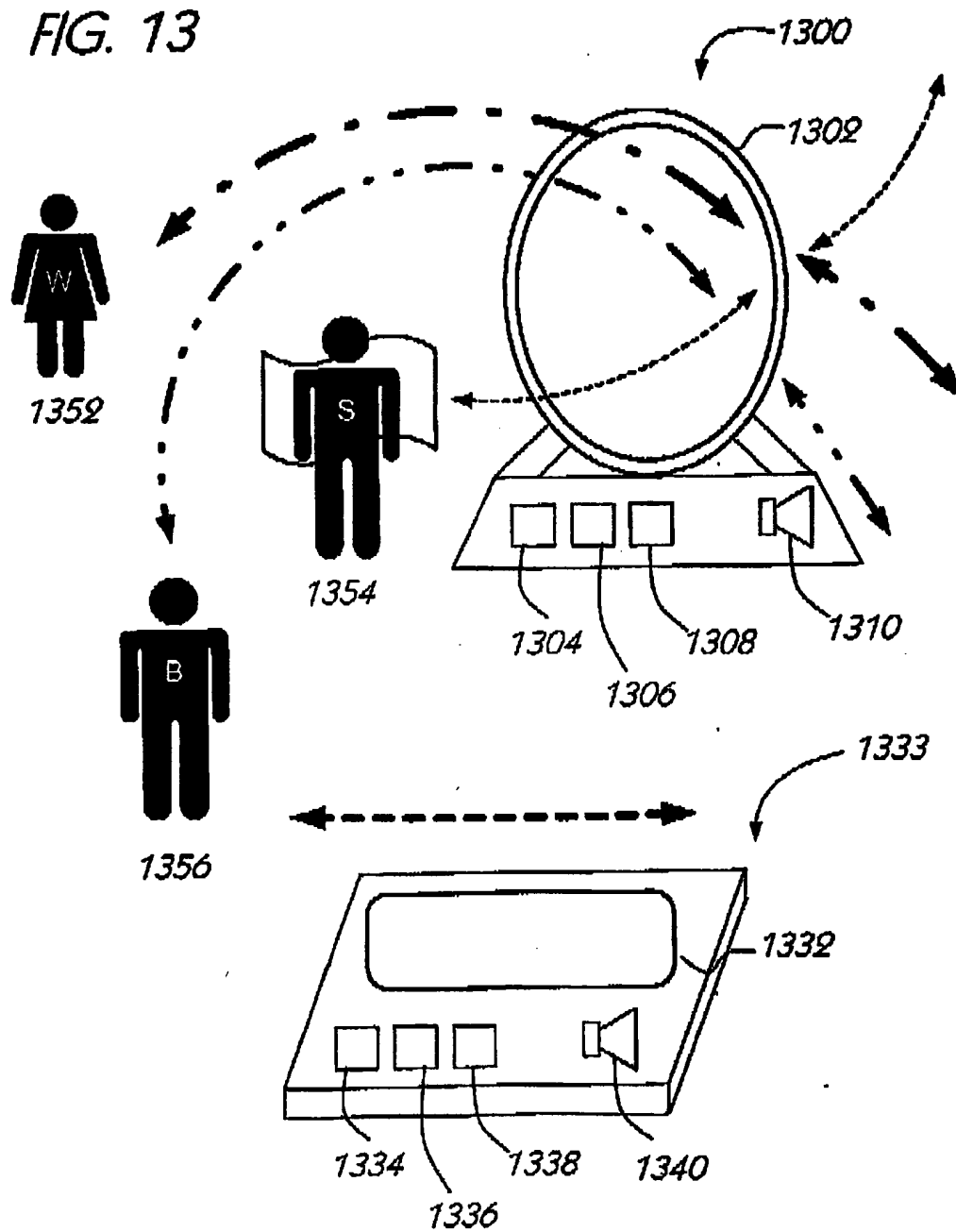


FIG. 14A  
1400

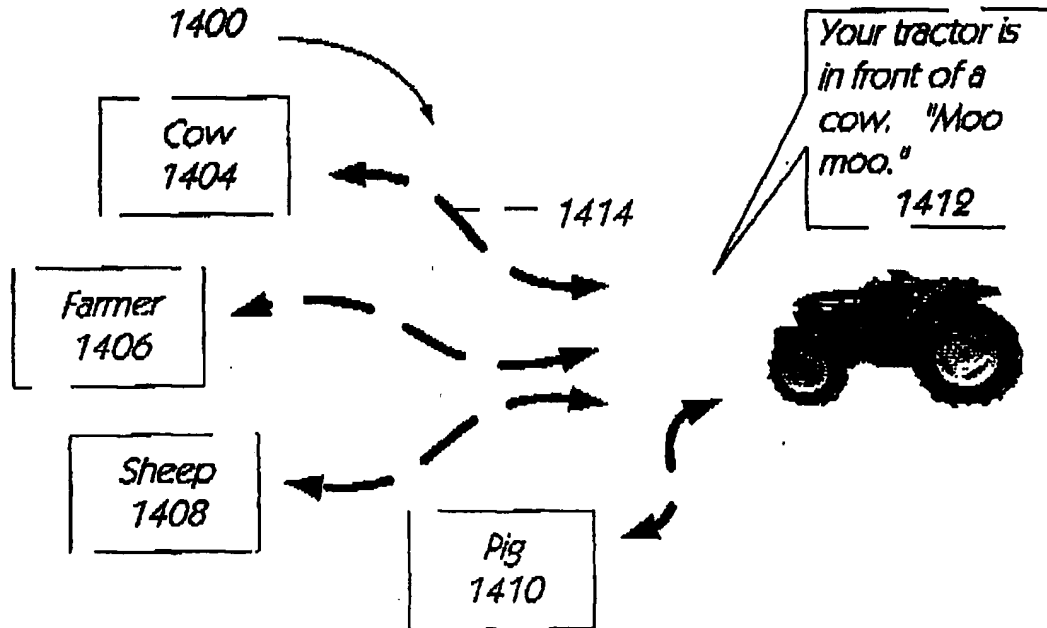


FIG. 14B

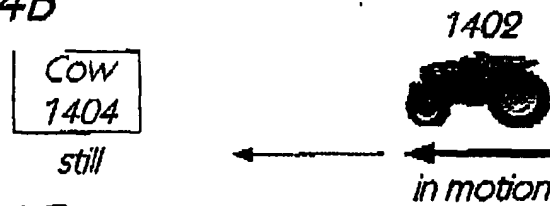


FIG. 14C

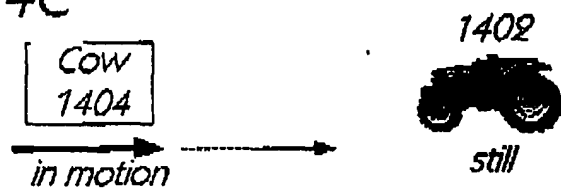


FIG. 14D

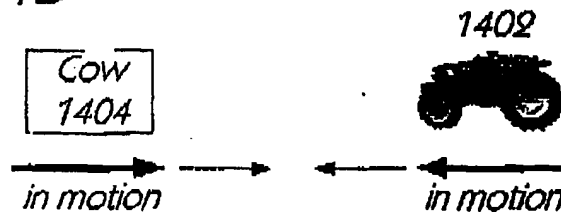


FIG. 14E



FIG. 15

# - Professor Oak's Vid-Phone -

PROF. OAKS SPEAKS

When you hold up  
Pokémon figure over  
the Vid-Phone, Prof.  
Oak speaks about it!

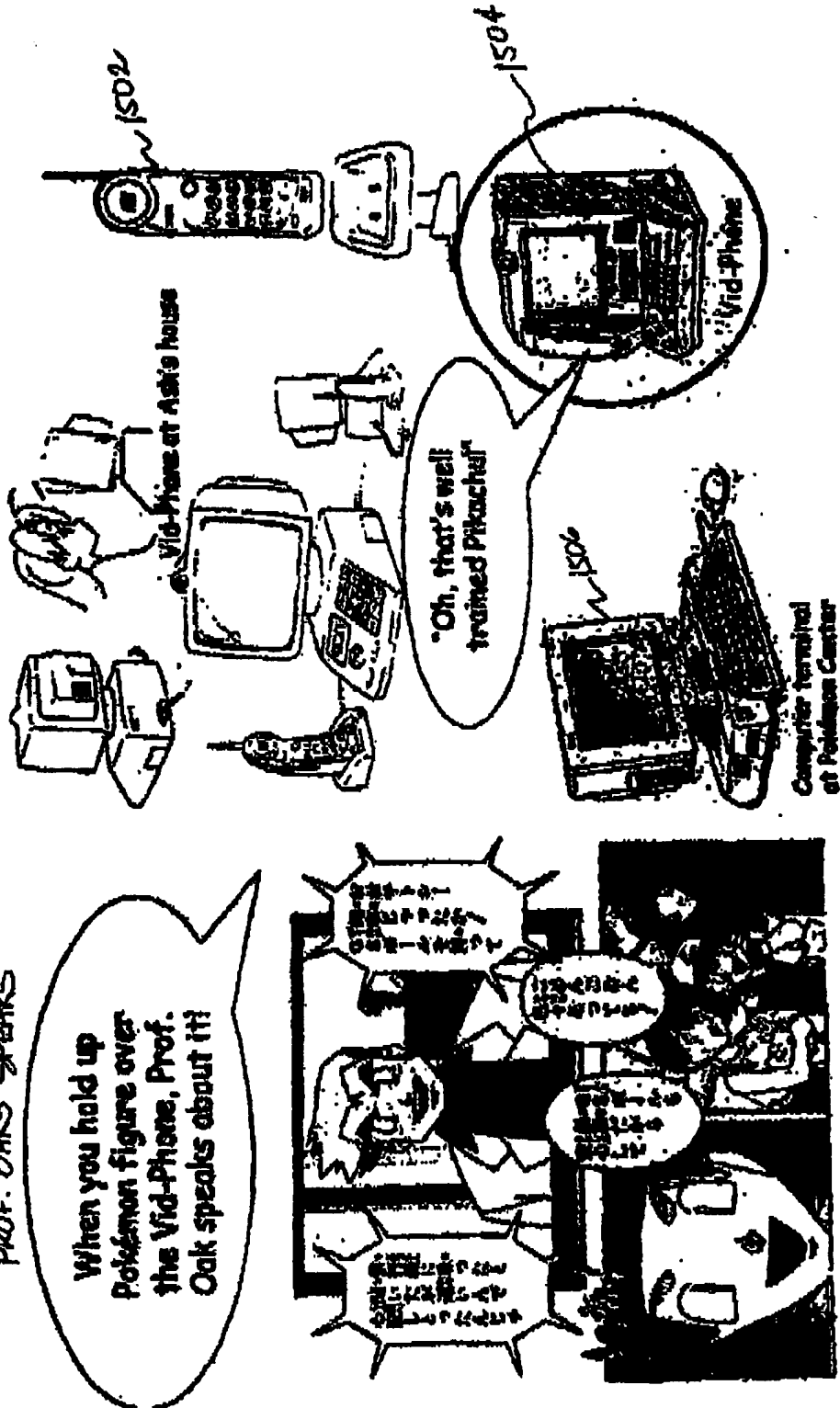


FIG. 16

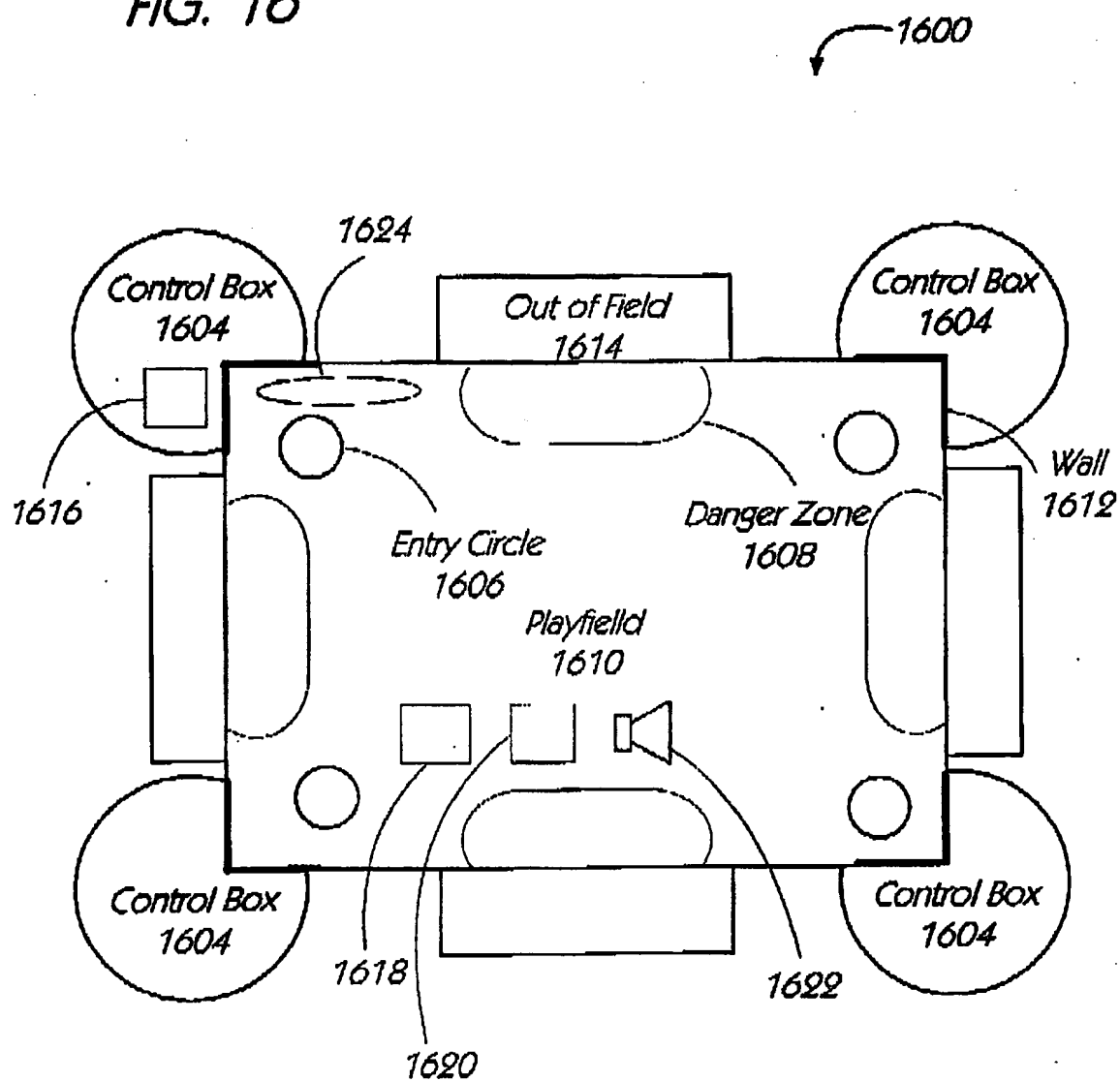
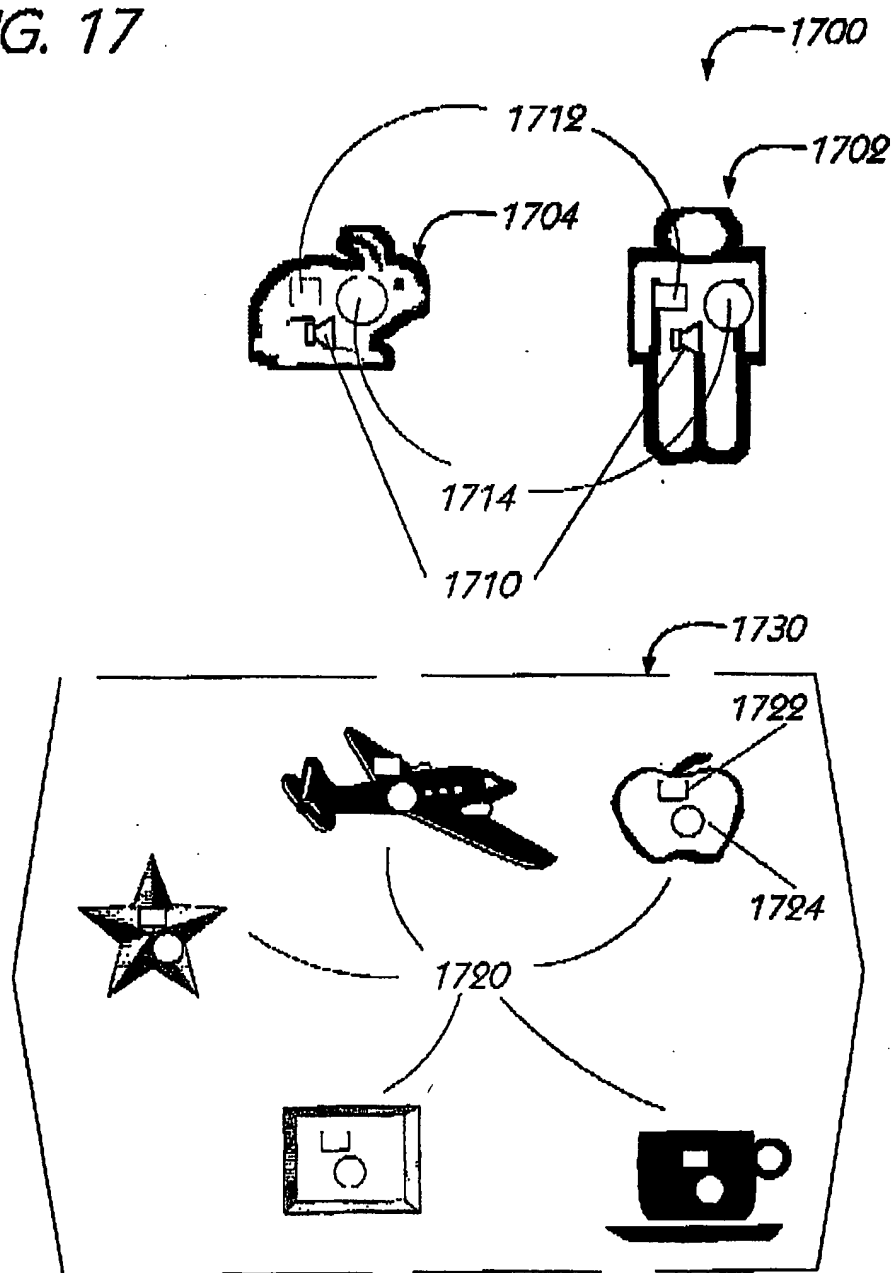


FIG. 17



# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/37425

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A63F 9/24; A63H 3/28; A63H 13/00

US CL : 446/397, 297; 463/39

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 446/397, 297; 463/39

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
NONE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A, P ✓	US 6,361,396 B1 (Snyder et al) 26 March 2002, entire document.	1-90
A, P ✓	US 6,364,735 B1 (Bristow et al) 02 April 2002, entire document.	1-90

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

23 March 2003 (23.03.2003)

Date of mailing of the international search report

31 MAR 2003

Name and mailing address of the ISA/US

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